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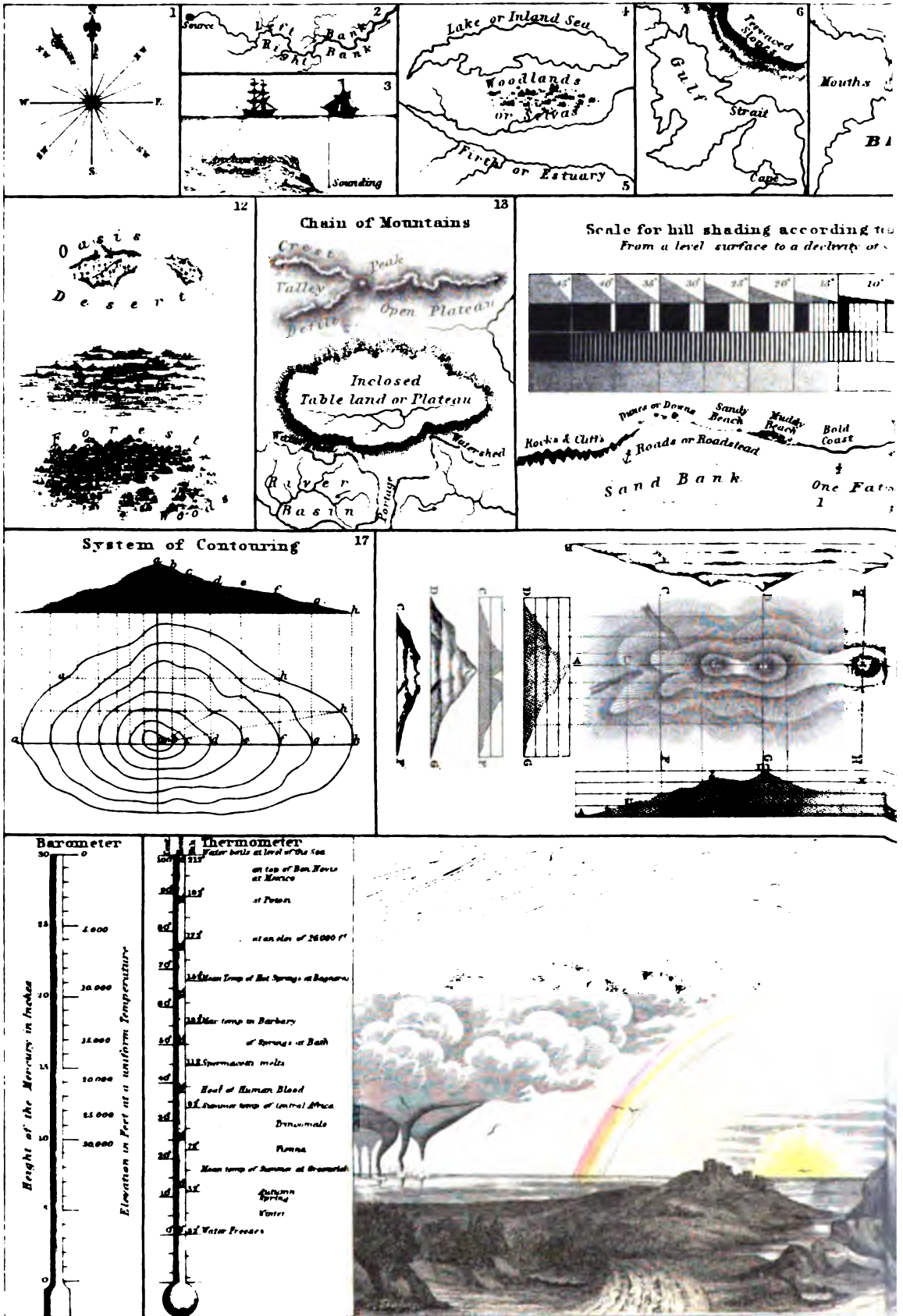
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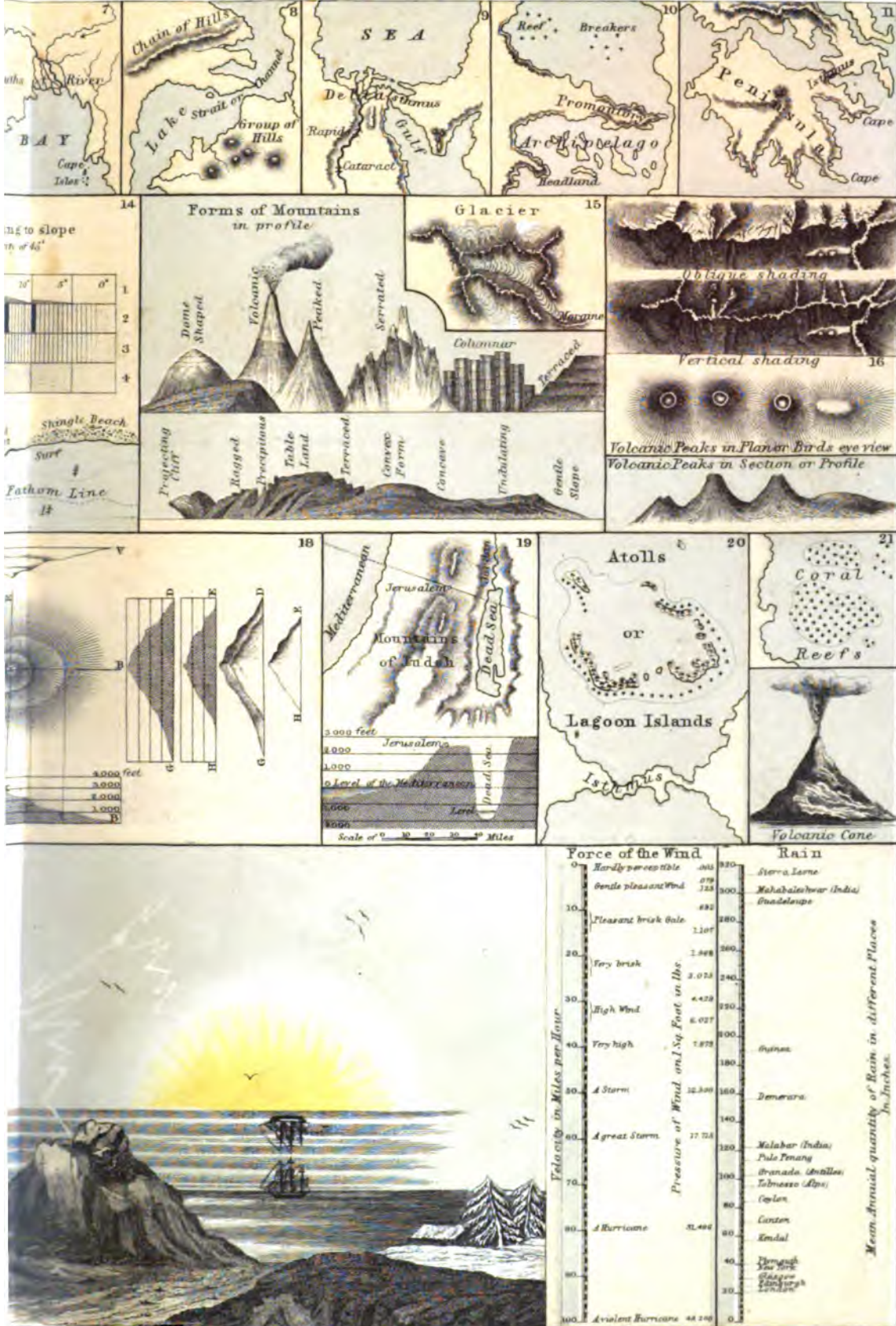


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ILLUSTRATING, IN A SERIES OF ORIGINAL DESIGNS,

THE ELEMENTARY FACTS OF
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NATURAL HISTORY.

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ALEX. KEITH JOHNSTON,

F.R.S.E. F.R.G.S. F.G.S.

GEOGRAPHER IN ORDINARY TO HER MAJESTY FOR SCOTLAND; AUTHOR OF THE "PHYSICAL
ATLAS," "THE NATIONAL ATLAS," ETC. ETC.



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P R E F A C E.

GEOGRAPHY has of late years assumed that position in the business of Education to which, from its interest and importance, it is so well entitled; and it is now found that, in order to do justice to its claims, it must be taught in a manner more systematic and orderly than was formerly considered necessary. The most obvious means of facilitating its study was the separation of its component parts into the great divisions of PHYSICAL or NATURAL, and GENERAL and DESCRIPTIVE GEOGRAPHY; and since public attention was first directed to the advantages of this distinction by the Author's folio Physical Atlas, many elementary treatises have been published for the purposes of general instruction. The subject-matter of each of these will find its appropriate illustration in the following Work, which has been prepared expressly for the purpose of conveying broad and comprehensive views of the Form and Structure of the Earth, and the principal phenomena affecting its outer crust.

Beginning with a representation of the Oceans, Lakes, Rivers, Mountain-Chains, Plains, and Valleys, of the different portions of the Globe, it proceeds to the distribution of those elements by which its surface is affected—Earthquakes, Volcanoes, Heat, Wind, and Rain—and concludes with the actual occupation of its surface by the different races, families, and species of plants, animals, and man.

The object of PHYSICAL GEOGRAPHY, in treating of inorganic matter, is to represent the Earth in its natural state, divested of the accidental or artificial divisions which have been introduced by man's agency. By a patient study and careful comparison of numerous facts, the knowledge requisite for such a representation has, within a recent period, been greatly extended. Comparative Geography has led to analogous views of the structure of the different Continents similar to those which comparative anatomy has established in relation to the lower animals and man. The bones and arteries of the latter have their representatives in the mountain-chains and river-courses of the former. Asia, in its continental mass, presents a picture of majestic unity; Europe, indented and broken up into numerous peninsulas, exhibits an example of the greatest diversity; while the Western Continent is remarkable for its grand simplicity. Again, contrasting climate and position, we find that Africa, presenting the greater part of its surface to the burning rays of a tropical sun, has all its days and nights of nearly equal length—the diversity of the seasons being almost unknown; while, in the frozen regions around the Poles, night extends its absolute empire, "day disappears with its radiant cortege, or if it shines, it is but the longest meteor of a long night."*

Physical Geography teaches that there is an intimate and reciprocal action of Man on the Earth, and of the Earth on Man, without attention to which it is not possible to understand the national character or physical development of a people. In the East, his wants being easily supplied, and having no necessity to struggle with nature, Man resigns himself to indifference and fatalism; while in the West, in order that he may live, he must conquer the obstacles which nature opposes to his progress; and hence much of the energy, the perseverance, and the intellectual pre-eminence which characterise the races of the West. The whole character of a nation may, as Dr Arnold observes, be influenced by its geology and physical geography. "Who can wonder," he says, "that the rich and well-watered plain of the Po should be filled with flourishing cities, or that it should have been contended for so often by successive invaders?"† It is the abundance of its coal-mines that gives to England its pre-eminence in the manufacturing world. China is chiefly interesting to us for its cultivation of the tea-plant, the Molucca islands for their spices, and Siberia for its furs. It is owing to the nature of the soil and climate that the southern states of North America are essentially agricultural; while, from having fewer advantages in this respect, and greater geographical facilities from sea-ports, the northern states are almost as essentially manufacturing and commercial.

The eminently suggestive character of the Maps will, it is hoped, enable the intelligent teacher to draw many such contrasts and comparisons. Physical Geography is the history of Nature presented in its most attractive form, the exponent of the wonders which the Almighty Creator has scattered so profusely around us. Few subjects of general education are, therefore, so well fitted to expand and elevate the mind, or satisfy the curiosity of youth.

* RITTER.

† *Lectures on Modern History.*

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DESCRIPTION OF THE PLATES.

Plate 1.—(Frontispiece.)

Fig. 1. The Mariner's Compass, distinguishing the true and the magnetic north points.

Fig. 2. A River Course, with arrows pointing the direction in which it flows. The *right* bank of a river is that on the right of a spectator situated with his back to its source.

Fig. 3. A Ship at Anchor. *Anchorage* or *anchor-ground* is a place unimpeded with rocks, where the water is neither too deep nor too shallow. *Sounding*—to ascertain the depth of water or the nature of the sea bottom—is performed by means of a lead attached to a line divided at certain intervals. Soundings, or ascertained depths, are marked on sea-charts in fathoms. (See fig. 14.)

Fig. 4. A Lake or Inland Sea is a portion of water surrounded by land. For the comparative sizes of lakes, see Plate 3. *Woodlands*, or *selvas*, land covered with natural timber. *Llanos* are vast plains of South America, alternately covered with rank vegetation, and reduced to a desert state by drought.

Fig. 5. *Firth*, or *Estuary*, an inlet of the sea connected with the mouth of a river. The term *firth* or *frith* is sometimes applied to an open channel, as the Pentland Firth, in which case it appears to have originated from the Latin *fretum*; but, as extensively used on the east coast of Scotland, it is undoubtedly derived from the *fjord* (pronounced *furth*) of the opposite shores of Scandinavia.

Fig. 6. Gulf, a recess of the ocean or of a sea into the land. It is often used synonymously with Bay; but the latter is applied either to a large or small extent of water, while the former is used only to designate an extensive recess of the sea.

Fig. 7. Bay, a large or limited recess of the ocean, or of a sea. (See *Gulf*, fig. 6.) The mouth or mouths of a river is a term used to designate the country near its entrance into a lake or estuary, or into the ocean. The French word *embouchure* is often so applied.

Fig. 8. Strait, a narrow passage between two continents or islands, or the entrance from the ocean to a gulf or lake. It is sometimes called a *channel*, and is often erroneously written Straits. See also fig. 6.

Fig. 9. Delta, from the Greek Δ , a term applied to alluvial tracts between the bifurcating branches of a river. The best example of a delta is that at the mouth of the Nile. *Isthmus*, a narrow neck of land joining two peninsulas. If the Isthmus of Suez were removed, Africa would be an island. *Cataract*, a sudden fall of a large body of water from a considerable height; the fall of a smaller body of water is called a *cascade*. A *rapid* is produced by a gradual declivity in the bed of a river. Rapids are sometimes navigable.

Fig. 10. Promontory, a tapering projection of the land into an ocean, sea, or lake. *Cape* is a part of the coast extending into the water beyond the general line, as in fig. 6; or the point of a promontory, as in fig. 11. *Headland* is a high bluff portion of the coast not projecting far into the sea. *Archipelago*, a sea interspersed with many islands, as the *Ægean Sea*. *Breakers*, a name applied to rocks or banks which impede the motion of waves, and cause them to break or foam.

Fig. 11. Peninsula, a portion of land almost surrounded by water. When the neck of land which joins a peninsula to other land is narrow, it is called an *Isthmus*.

Fig. 12. Desert, a tract of sterile land, covered with sand or loose stones: the term is often applied to uncultivated wastes not devoid of vegetation. *Oasis* is an isolated spot in a desert, where perennial vegetation is supported by springs.

Fig. 13. Chain of Mountains, a series of elevations linked together continuously, so that their length greatly exceeds their breadth: the *Crest* is the highest part of the range. *Peak* is the term applied to the conical or pointed summit of a mountain. *Table-land*, or *Plateau*, is a portion of the surface of the earth

elevated above the level of the region in which it is situated: it may be entirely surrounded by mountains or cliffs, or only bounded on one side by higher land. *Watershed* is the ridge line, from the slopes of which waters flow in different directions. The space enclosed by a watershed is called a *River-basin*. A *Portage* is that portion of the watershed over which goods or boats may be transported from one river to another.

Fig. 14. High-lands, or Mountains, are represented on maps by means of shading, which is, or ought to be, darker in proportion as the height is greater. The shading is produced by lines, or *hachures*, placed alongside of each other, or by graduated tints. This scale shows the requisite depth of shadow necessary to represent any elevation, from a plain to a slope of 45°.

Roads, or *Roadstead*, an open and exposed anchorage-ground where ships are sheltered under lee of the land. *Sandbank* is an accumulation of sand under water, diminishing the depth of the sea. *Surf* is the name applied to waves which break upon a flat shore. The character of a coast line, whether bold or flat, &c., is indicated on charts by signs indicating cliffs, dunes, sand, mud, shingle, &c.

Fig. 15. The different forms of mountains, cliffs, &c. shown in profile. Topographical plan of a Glacier, showing descent of frozen snow, and Moraine at the bottom.

Fig. 16. (Upper section.) The method of oblique hill shading adopted in the new survey of Switzerland, and other Continental maps. The light is here represented as coming from one side only, thereby increasing the effect of relief. In vertical shading (lower section) the light is supposed to fall perpendicularly. According to this method—which is adopted in the trigonometrical surveys of England and France—the effect is less picturesque, but greater accuracy is secured. *Volcanic* peaks represented as they would be seen vertically, from a great elevation: the same, as seen horizontally from the surface of the earth.

Fig. 17. *Contouring* is a method of representing, by lines on a flat surface, all those portions of a mountain which have the same elevation. The shaded section is supposed to be a rock in the ocean, the bottom of which, *o h*, is on a level with the surface of the sea at low water; as the tide rises, the line of level, or *contour line*, is successively raised to *1 g*, *2 f*, &c. The lines under the section show the projection of the contours according to the principles of surveying.

Fig. 18. Plan of an isolated mountain, seen vertically, with contours shaded according to scale fig. 14; the sections show the outlines of its several sides, with their elevations in feet, and method of shading.

Fig. 19. A portion of Palestine, with the Dead Sea, to convey an idea of the method of representing absolute height and depth, vertically and in profile.

Fig. 20. Atolls, or lagoon islands, are circular reefs of coral formation rising out of the sea and enclosing a lagoon. Other forms of coral reefs are shown in fig. 21.

CLIMATOGRAPHY.

The names of the objects represented in the view of atmospheric phenomena are given by references at the bottom of the Plate.

The *Barometer* scale shows how much the mercury falls, for every 5000 feet, in ascending into the atmosphere: thus, supposing the temperature uniform, and the height of the mercury in the tube to be 30 inches at the level of the sea, it would fall to 29½ inches if carried to a height of 30,000 feet. In measuring the height of mountains with the barometer, correction for difference of temperature between the base and summit, at the time of the observation, forms an important element in the calculation. The *Thermometer* is divided into degrees, according to the Centigrade, Reaumur, and Fahrenheit scales—the former of which is mostly used on the Continent, and the latter in this country. The temperature at which water boils at different

elevations has been used as a means of ascertaining the heights of mountains.

The different kinds of winds are named according to their estimated velocity in miles per hour, and the scale shows the calculated amount of pressure, in pounds, exercised by each on a square foot of surface. The scale on the right side of the Plate gives the ascertained amount of rain which falls in different places, showing the remarkable increase of quantity in proceeding from temperate to tropical countries.

Plate 2

Gives a connected view of the ocean currents over the globe. These singular marine movements are distinguished as *constant*, *periodical*, and *variable* currents—the latter two being produced by winds and tides. The constant or ocean currents commence at the South Pole, under the name of the Antarctic Drift current, which, after pouring a stream of cold water along the shores of Chile and Peru, flows W. through the Pacific and Indian Oceans, entering the Atlantic by the *Cape current*. The direction of the stream is now N. along the W. shores of Africa, till, near the line, it is carried W. by the *Equatorial current*, which, entering the Gulf of Mexico, originates the *Gulf stream*. This remarkable current carries an immense volume of warm water from the Gulf of Mexico across the N. Atlantic, in a N.E. direction, towards the shores of Britain, France, Norway, and even to Iceland and Spitzbergen. In the S. hemisphere, a stream is understood to flow from the Atlantic, S. of Cape Horn, into the Pacific Ocean, in order to commence anew the circuit of the globe. The diagrams at the foot of the map show—1. The globe divided into two hemispheres, the northern, of which Britain is nearly the centre, containing the greatest amount of land, and the southern, the most central point of which is New Zealand, the greatest amount of water; 2. The thickness of the crust of the globe, as estimated from the highest known mountain and the deepest measured part of the sea, the difference being upwards of 10½ miles.

Plate 3.

All the most important lakes of the globe are here collected, arranged in the several continents, and compared with each other in size, form, height above or below the sea, depth of water, and character of the countries in which they are situated. Their division into fresh-water and salt-water lakes does not admit of precision, as almost every degree of saltiness is found between the freshest and the most salt. Their chief characteristics may be thus stated:—1. Those which have no apparent affluent nor outlet: these are generally small, but, being fed by subterraneous springs, are more permanent than larger lakes. 2. Those which have an outlet, without any visible affluents. 3. Those which receive affluents, without having any visible outlets. These are common in Asia; the most striking examples are the Caspian, the Aral, and the Dead Sea. 4. Those which have both affluents and an outlet. Among fresh-water lakes, these are the largest and most numerous—as Ladoga in Europe, Baikal in Asia, Tchad in Africa, and the Canadian lakes in America. The outlet from a lake is sometimes subterraneous, as in the case of the Lake of Joux, in Switzerland. Lakes are not subject to tides, and many of them never freeze, on account of their great depth. The largest fresh-water lakes are those of North America. The highest are Sir-i-Kol, in Central Asia, 15,600 feet; Mansarowar, in Tibet, 15,256 feet; Lake Titicaca, in South America, 12,846 feet; the Trüb Lake, in Switzerland, 7200 feet. Lake Superior is only 596 feet above the sea. The most remarkable for depression below the level of the sea are—the Caspian, 83 feet; the Lake of Tiberias, 329 feet; and the Dead Sea, 1312 feet.

Plate 4.

In this map the world is divided into its great river basins, showing by colours the different oceans, seas, &c., into which the flowing waters of the several continents discharge themselves. From this an idea may at once be formed of the general inclination or slope

of the different continents. Thus, in Europe and Asia the longest rivers flow towards the N., showing the gradual slope of the continent in that direction; while the shortest flow towards the S., showing that the inclination in that direction is more abrupt. In America the long gentle slope, as indicated by the rivers, is towards the east, the short rapid slope towards the west. The great basin of the continental streams in Central Asia presents a large portion of the globe in which the rivers discharge themselves into inland lakes, and do not immediately reach the sea. Similar spaces occur in Africa and America. In the diagram at the foot of the Plate, the principal rivers of the different continents are, for the sake of comparison, drawn to the same scale as that of the chart, and their length is stated in English miles.

Plates 5 to 10.

This series of maps is intended to convey correct information regarding the *relief* of the continents and of the British Isles. The *physical* position of a place, or its elevation in the atmosphere above the level of the sea, is an element of as much importance in regard to its climate, vegetation, and other circumstances, as its *geographical* position, or its vicinity to, or distance from, the Equator. This information cannot be conveyed in an ordinary geographical map, which must necessarily contain many names and political divisions, to the exclusion or obliteration of the purely physical features. The forms of relief on the globe are varied to an almost infinite extent, yet they may be classified according to their most prominent features. These are—1, *Mountains* which, disposed in linear chains or scattered in isolated groups, extend over the surface of plains and table-lands in every variety of form; 2, *Table-lands* or *plateaus*—elevations of the surface rising to a considerable height, and presenting the form of a table or platform; and 3, *Plains* and *valleys*, or *lowlands*—portions of the surface little or not at all raised above the level of the ocean. On comparing the great mountain chains of the different continents, the first observation is, that in the Old World, Europe, Asia, and Africa, they follow, in general, the direction of the parallels of latitude, or extend somewhat in a direction from east to west; while in the New World, North and South America, the principal chains extend in the direction of the meridian, or from north to south. And next, that in all cases the table-lands are intimately connected with the mountain ranges—the highest mountains invariably rising, not from plains, but from table-lands. The Old World is most remarkable for its mountains and table-lands, and the New World for its plains. Western Asia is entirely composed of table-land, varying from 3000 to 6000 feet in height; while all Africa, south of the Desert, is understood to be an immense table-land of great elevation. The north of Europe and Asia, however, is one vast and almost uninterrupted plain, so that from the western shores of France through the Netherlands, Germany, Russia, the steppes of the Caspian and Siberia, the whole extent may be traversed without changing the level more than five or six hundred feet. But the plains of Europe and Asia are insignificant when compared with those of America, the northern portion of which has little interruption from heights in the central space, extending between the Arctic Ocean and the Gulf of Mexico; while in South America the central portion is traversed by level plains from the Llanos of the Orinoco in the north, to the steppes of Patagonia in the south—a distance of more than 2300 miles. In the British Isles the table-lands and mountains are shown to occupy the northern and western portions, while the plains occur chiefly in the south and east.

Plate 11.

In this map the geographical positions of active and extinct volcanoes over the globe are distinguished by red and black spots, and the districts most liable to be visited by earthquakes are marked by different degrees of shading, as explained in the notes. The diagram at the bottom of the Plate shows the height of the principal mountains, distinguishing the active volcanoes.

Plate 12.

The distribution of heat over the globe is here rendered perceptible to the eye by lines drawn through all places having the same mean annual temperature. These are called *isothermals*, and their deviation from parallelism with the Equator shows that latitude, or distance from the Equator, alone, gives little indication of the temperature of any particular place. The mean annual temperature of the principal places on the globe is stated in figures on the principal map. The map of Central Europe shows by red and blue figures the summer and winter temperature of the principal meteorological stations, while that of the British islands presents the three elements of summer, winter, and mean annual temperatures. If these were connected by lines, the first would be called *isothermal*, the second *isochimnal*, and the third *isothermal* lines. July is, on an average, the hottest, and January the coldest month; the mean annual temperature occurs in April and October in the north temperate zone. Near the parallel of 30° W., the extreme temperature of summer and winter, (July and January,) for the latitude, is stated in blue and red figures. Places where the temperature of the latitude agrees with the isothermal line, are said to have a normal temperature; those where the isotherm is lower, are relatively *colder*, and those where higher, relatively *warmer*, than the normal. A remarkable example of the latter occurs on the west coast of Europe, where the warm water of the Gulf Stream has the effect of carrying the isothermals many degrees north of their normal position. A climate is called an *insular* or *sea* climate where the difference of mean temperature is very small, or where the winter is too warm and the summer too cool; and a *continental* climate where the difference of mean temperature is very great, or where the winter is too cold and the summer too hot. Europe has a true insular climate—a mild winter and a cold summer. Northern and Central Asia has a true continental climate—a cold winter and a hot summer; while North America has more of a continental climate in winter, and a sea climate in summer. The hottest locality on the globe is in Central Africa, where the temperature of July is 90° Fahr., and the coldest in Siberia, where the temperature of January is 40° below the freezing point of Fahr. scale. In the old continent, the cold comes from the N.E., and in the new, from the N.W. The cold region of Siberia has no corresponding region of equal cold in America. If the globe be divided at the meridian of 20° W., we find that the eastern portion, which has the largest mass of land, is colder than the western, and that the difference diminishes as we approach the Equator. The temperature of the whole globe increases 8° Fahr. from January to July; a mean between these months gives, as the mean temperature of the globe, 58° Fahr. The mean temperature for the N. hemisphere is 60° Fahr., and the mean for the S. hemisphere 56° Fahr. The great quantity of rain which falls in the N. hemisphere is probably one cause of its higher temperature, while, in the S. hemisphere, the influence of the sun's rays is expended to a great degree in the melting of masses of ice, or in the evaporation of snow.

Plate 13

Presents a graphic representation of the principal phenomena of the winds over the globe. Near the centre is the zone of calms and variable winds and storms, corresponding to the zone of constant rain in Plate 14. North and south of this belt is the region of the *Trade* or passage winds, called *Vents alisés* by the French; and beyond these, the regions of the south-westerly and north-westerly currents of air. The Indian Ocean is the region of the *Monsoons*, (the *Moussons* of the French,) included within which is the district of the *Typhoons*, or storms peculiar to the China Sea. The diagrams at the foot of the Plate are devoted to an explanation of the *Hurricanes* of the West Indies and the Indian Ocean, and of the varying limits of the trade-winds in the Atlantic, according to the different seasons. The hurricanes of the Indian Ocean and of the West Indies, and the typhoons of the China Sea, appear to be subjected to peculiar and fixed laws for each hemisphere, both as regards their movements of translation and their rota-

tory movements. These tempests originate between the equator and the tropics during winter, when the regularity of the trade-winds is interrupted, or during the change of the monsoons. They obey a double movement—the one of translation or progress, and the other of a gyratory or rotatory kind. On the N. of the Equator the rotatory movement is from *right* to *left*, while on the S. of the Equator it is reversed, or passes from *left* to *right*, as shown on the plate. The movement of translation takes the form of a parabolic curve, the summit of which is towards the west. On the N. hemisphere this curve forms a tangent to the meridian about lat. 30°, and in the S. hemisphere about lat. 26°, corresponding with the north and south limits of the trade-winds. In the Indian Ocean, these storms uniformly come from the eastward, and travel to the westward and southward, as shown in the chart of the Rodrigues hurricane. The West Indian hurricanes commence near the Leeward Islands, travel to the W.N.W., and then round the shores of the Gulf of Mexico, following the Gulf Stream, and are lost in the Atlantic, between the Bermudas and Halifax. The chart in the left corner of the Plate shows the date of occurrence, and course of some of the most important of these storms. The rate of progress of a hurricane varies in different parts of its course; that of the Rodrigues storm has been calculated at from 220 to 230 miles a-day at first, diminishing, as it approached the tropics, to about 50 miles a-day.

Plate 14.

Rain is distributed very unequally over the globe. In general it is most abundant in those regions where evaporation is carried on most rapidly; but there are striking exceptions to this rule, for in many places, even near the tropics, it seldom or never rains. These rainless districts comprise vast regions, almost devoid of vegetation. On the contrary, there are regions where rain is almost incessant, and where, consequently, vegetation is rank and abundant. The zone of greatest precipitation is situated on the north of the Equator, and corresponds with the zone of "the variables" in Plate 13. Within this belt, on the west coast of Africa, the average annual quantity is 189 inches. Rain is in general most abundant at the Equator, where the temperature is highest; and the quantity decreases, irregularly, as we approach the Polar regions. The average annual fall within the tropics is 95 inches, and within the temperate zone 34 inches. This is shown graphically in the diagram ("Increase of Rain with Heat") at the foot of the Plate. The diagram of "Decrease of Rain with Distance from Coasts," illustrates a general law occasioned by the greater amount of vapour that arises from the sea than from the land. In the temperate zone of both hemispheres, the western coasts are proportionally more moist than the eastern, because they are exposed to the prevailing westerly currents of air which, passing over the ocean, are highly impregnated with moisture. Within the tropics, the eastern coasts, especially in America, are more moist than the western, from their exposure to the trade-winds. In certain districts more rain falls in one season than another; these are distinguished on the map as the summer, winter, and autumn rains. Snow never falls within or near the tropical regions at the level of the sea. The blue lines on the map show that the deposition of moisture in this form is, in the northern hemisphere, limited to the north of India, the Mediterranean, and the Gulf of Mexico; while in the southern hemisphere it does not approach nearer the Equator than the south of Australia, the Cape colony, and Patagonia. The fall of snow increases with the decrease of temperature, in proceeding from the equatorial towards the polar regions. In Europe this decrease occurs in the following order:—Rome has 1½ snowy days in each winter, Venice 5½, Milan 10, Paris 12, Carlsruhe 26, Copenhagen 50, and St Petersburg 171. The actual elevation of the snow line—the line of perpetual congelation—or the lowest point on a mountain at which snow is never entirely melted, in the different zones, is shown in the diagram on the left of the map, and on an enlarged scale in Plates 15 and 16.

Plate 15.

The plants of any particular region are the exponents of its climate; certain plants will grow spontaneously only within certain districts or zones, the boundaries of which are dependent on the amount of heat and moisture which such zones receive in the course of the year. Hence we find that trees, grain, and shrubs range themselves on the globe according to lines of equal summer and equal winter temperature: the lines of summer temperature, for example, indicate precisely the limits of the possible cultivation of annual plants. Nor is a knowledge of the capabilities of a country for producing plants less important with reference to its population. Comparing Naples with Norway, for example, we find that the effect of climate is such as to render the harvest five times more productive in the former than in the latter, while, in consequence, the population is twenty-five times more dense, in proportion to its area, in Naples than in Norway. The object of this map is, by dividing the whole earth according to its peculiar flora, into certain climates of vegetation, to present, at one view, the distribution of the most useful and valuable wild and cultivated plants. Each of the plant climates is characterised by certain trees, grains, and fruits, the number and variety of which increases as we approach the Equator, and decreases towards the polar regions, where their only representatives are a few mosses and grasses. Rice, which supports the greatest numbers of the human family, is chiefly confined to the tropical regions of Asia and America. Wheat requires a mean annual temperature of 37° or 39° Fahr. Maize extends to lat. 40° N. and S. in America, and to lat. 50° or 52° N. in Europe. Barley to lat. 70° N. in Norway. Rye to lat. 67°, and oats to lat. 65° N. Since heat decreases as we ascend into the atmosphere, so mountains situated between the tropics, the summits of which rise above the snow line, represent the vegetable zones of the whole earth, rising one above the other *vertically*, in the same order as they observe in a *horizontal* direction from the Equator to the Poles, on plains. This is explained by the colours on the diagram at the bottom of the Plate, on which also is represented the actual ascertained limits of the snow line in different latitudes. In the Himalaya this will be observed to be 19,000 feet on the north, while it is only 15,500 feet on the south side—an anomaly which has been considered due to the radiation of heat from the high land of Tibet, but which is more probably owing to the greater quantity of snow which falls on the southern than on the northern slopes of the mountains.

Plate 16.

Animals, like plants, are adapted to special climatic conditions; like them, also, they are subjected to invariable laws. Each zone, or region of climate, is occupied by some species of animals peculiar to itself, beyond the limits of which they will not range if left to their natural freedom. A group of animals, embracing all the species both terrestrial and aquatic, inhabiting any particular region, is called a *Fauna*, in the same way as the plants of any particular country is called its *Flora*. In this map the faunas of the two hemispheres are distributed in three principal divisions—namely, the tropical, temperate, and arctic faunas, each of which is characterised by peculiar species of animals. These, like plants, attain their highest development under the torrid zone, which is distinguished not only by the greatest variety, but by the size, strength, and beauty of its animal formations. In proportion as we recede from the Equator, so the covering of animals loses its brilliancy of colour, until, in the polar regions, all animals, whether marine or terrestrial, assume a nearly uniform and sombre hue. From a comparison of this with the preceding map, it will appear that the nature of their food has an important bearing on the distribution and the grouping of animals, those of the herbivorous kind being more or less limited to particular vegetable zones, while, since the food of carnivorous animals is everywhere present, their range is, in this respect, much less confined. The diagram at the foot

of the Plate represents the distribution of animals in a vertical direction, showing, as in the case of plants, that those nearest the level of the sea correspond with those of the torrid zone; while near the snow-line near the tops of mountains, the animals are similar to those of the arctic zone.

Plate 17.

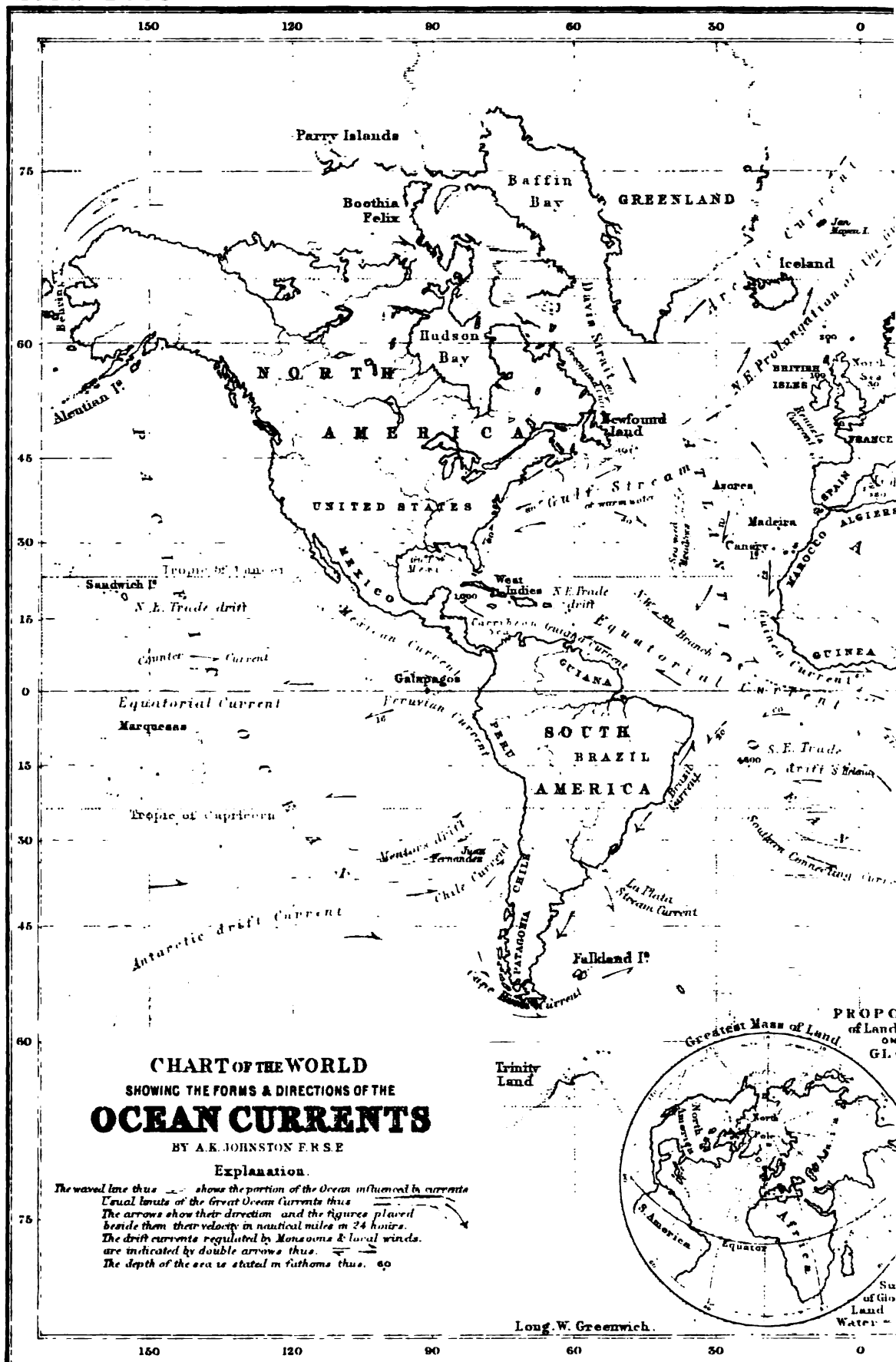
The geographical distribution of man is different from that of all other organic beings; his constitution renders him more cosmopolite, while, from the superior structure of his physical frame, as well as his mental endowments, he is less subject to the influence of external circumstances than any of the inferior animals: hence he is found in every locality over the globe, under every climate, and at every degree of altitude to which organic life extends. All the various races of man existing on the globe have originated from one species, but distinct races have been known to exist since the earliest dawn of history and tradition. The principal map exhibits the distribution of the leading races of man, as existing at the present time, the localities of which are explained by the reference-figures and colours. The Ethnographic map of Europe presents a more minute subdivision of these races in this quarter of the globe. The diagram in the right corner of the Plate explains, by means of the scale of feet, the height above the level of the sea of inhabited places in different countries. Coloured lines and a scale placed near the meridian of 20° W. on the upper map, indicate the prevailing kinds of food used by the inhabitants of the different zones. Thus, within the tropics, the principal food of the human family is derived from the vegetable kingdom; beyond the tropics, north and south, a mixed animal and vegetable diet is used; while, north of the arctic circle, the food of man is derived entirely from the animal kingdom. A faint line passing through Greenland and the north of Asia points out the northern limit of permanent habitation; the corresponding line in the southern hemisphere passes south of Cape Horn and Tasmania.

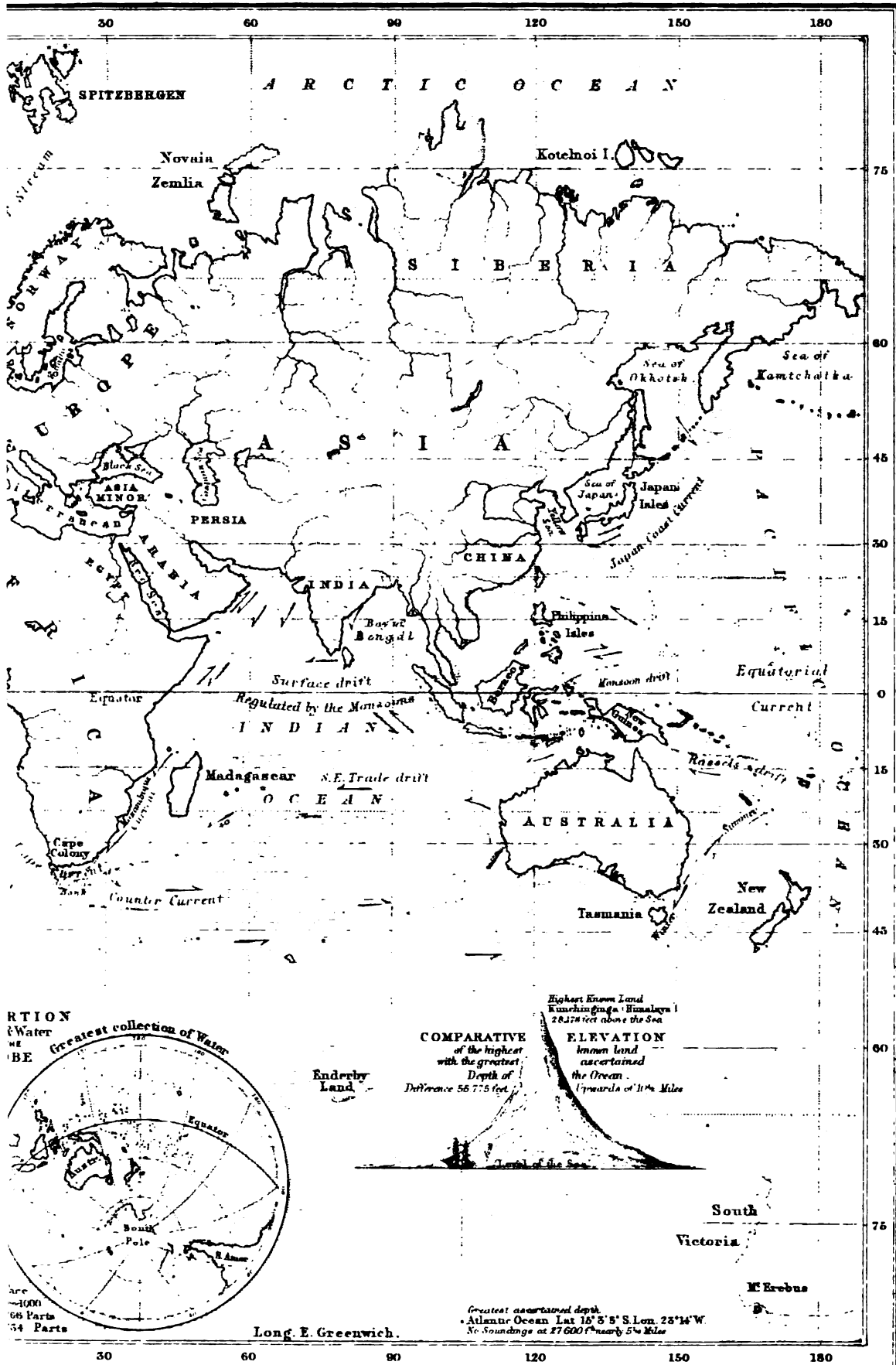
Plate 18.

As a necessary accompaniment to the distribution of man according to races, we have, in this Plate, arranged the globe by colours, according to the great leading divisions of religious belief. The vast regions coloured brown, indicate, pretty nearly, the countries yet in a state of barbarism, occupied by different tribes of heathens; while those more or less civilised are ranged under the blue, pink, green, and yellow colours. In the small tables are pointed out (on the first line) the present population of the different countries, in round numbers, with the proportion belonging to each of the prevailing forms of belief, omitting the minor sects. Europe, it will be observed, is occupied by three leading sects—Roman Catholics in the S.W., Greek Catholics in the E., and Protestants in the middle and north. A comparison of this with the preceding map will show that, in general, the Roman Catholic comprises the Celtic population, the Greek the Slavonian, and the Protestant the Teutonic or German. "It is a most significant circumstance, that no large society, of which the tongue is not Teutonic, has ever turned Protestant, and that, wherever a language derived from that of ancient Rome is spoken, the religion of modern Rome to this day prevails."¹ This latter fact is strikingly exemplified in the countries of Spanish America. The diagram under the Title points out the estimated numbers of the different creeds over the globe, while, in that on the left corner of the Plate, an attempt has been made to point out, graphically, the comparative progress of education in different countries, in so far as this can be ascertained by statements regarding the attendance at school of that portion of the population comprised between the ages of seven and fourteen. The colours correspond with those on the map and explanatory diagram. The blue tint, which, in general, occupies the highest part of the scale, strikingly illustrates the intellectual activity of the Teutonic (Protestant) nations.

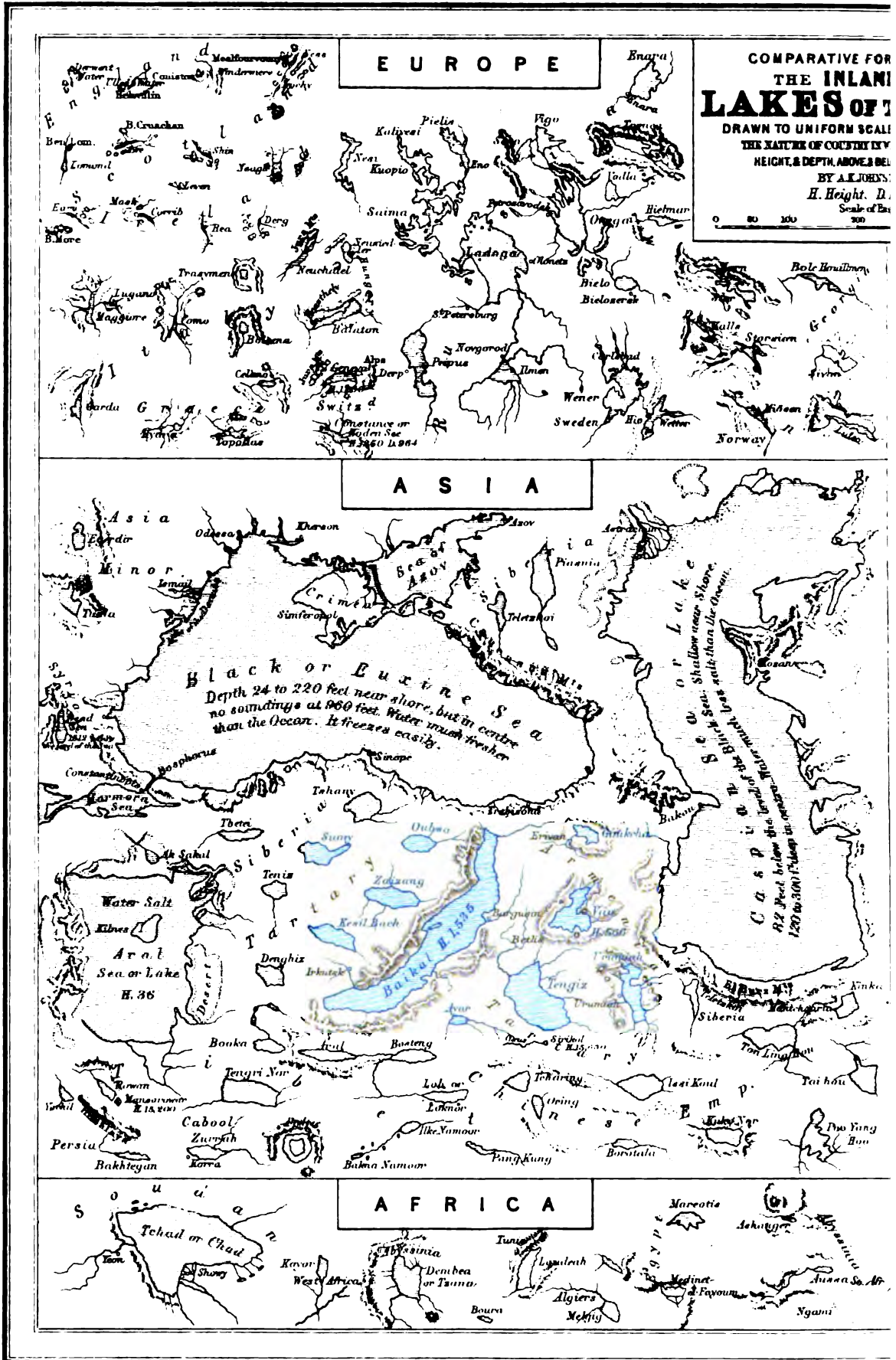
¹ MACAULAY'S *History of England*.

HYDROLOGY





By Wm. H. Johnston Philad.



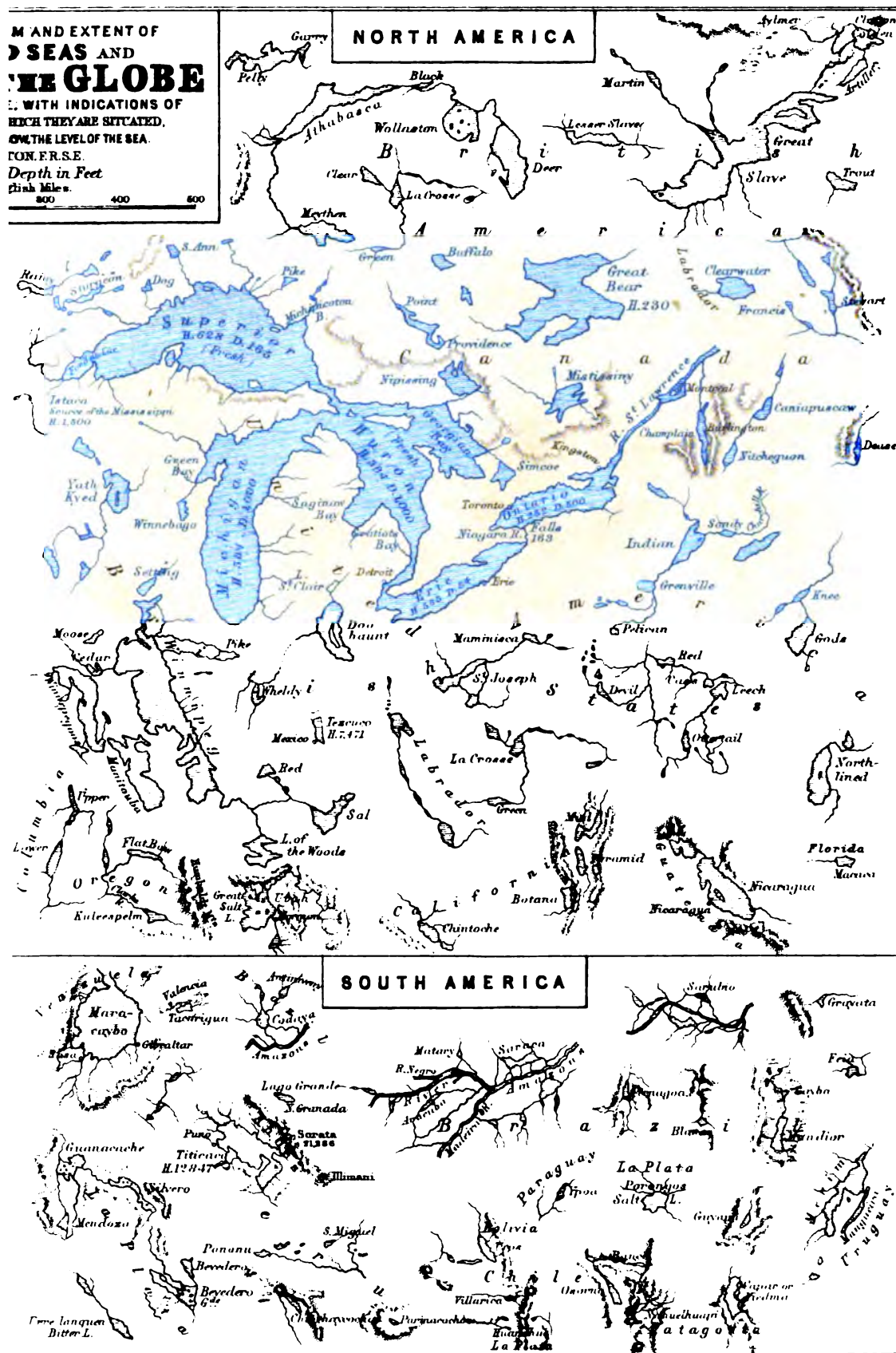
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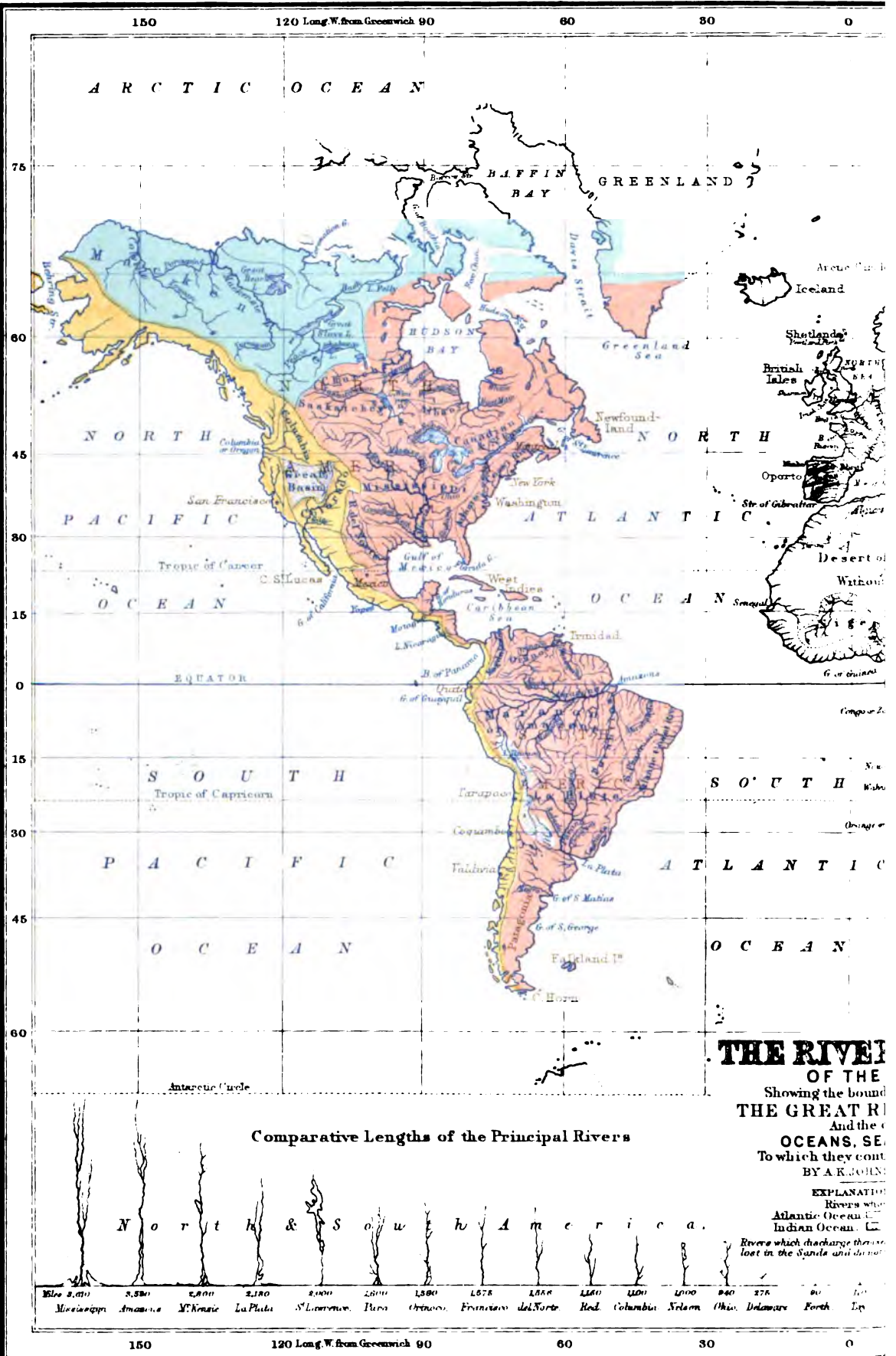
MAN AND EXTENT OF THE SEAS AND THE GLOBE

WITH INDICATIONS OF
 EACH THEY ARE SITUATED,
 ON THE LEVEL OF THE SEA.

ION. F. R. S. E.
Depth in Feet
English Miles.



HYDROLOGY



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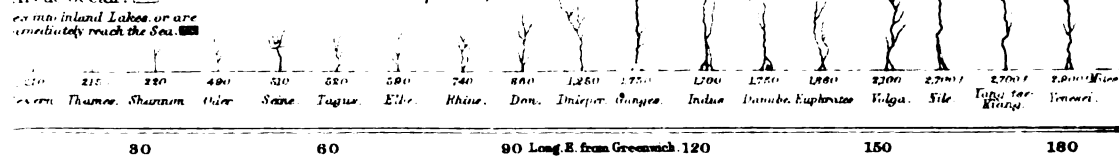
On a scale corresponding with that of the Map.

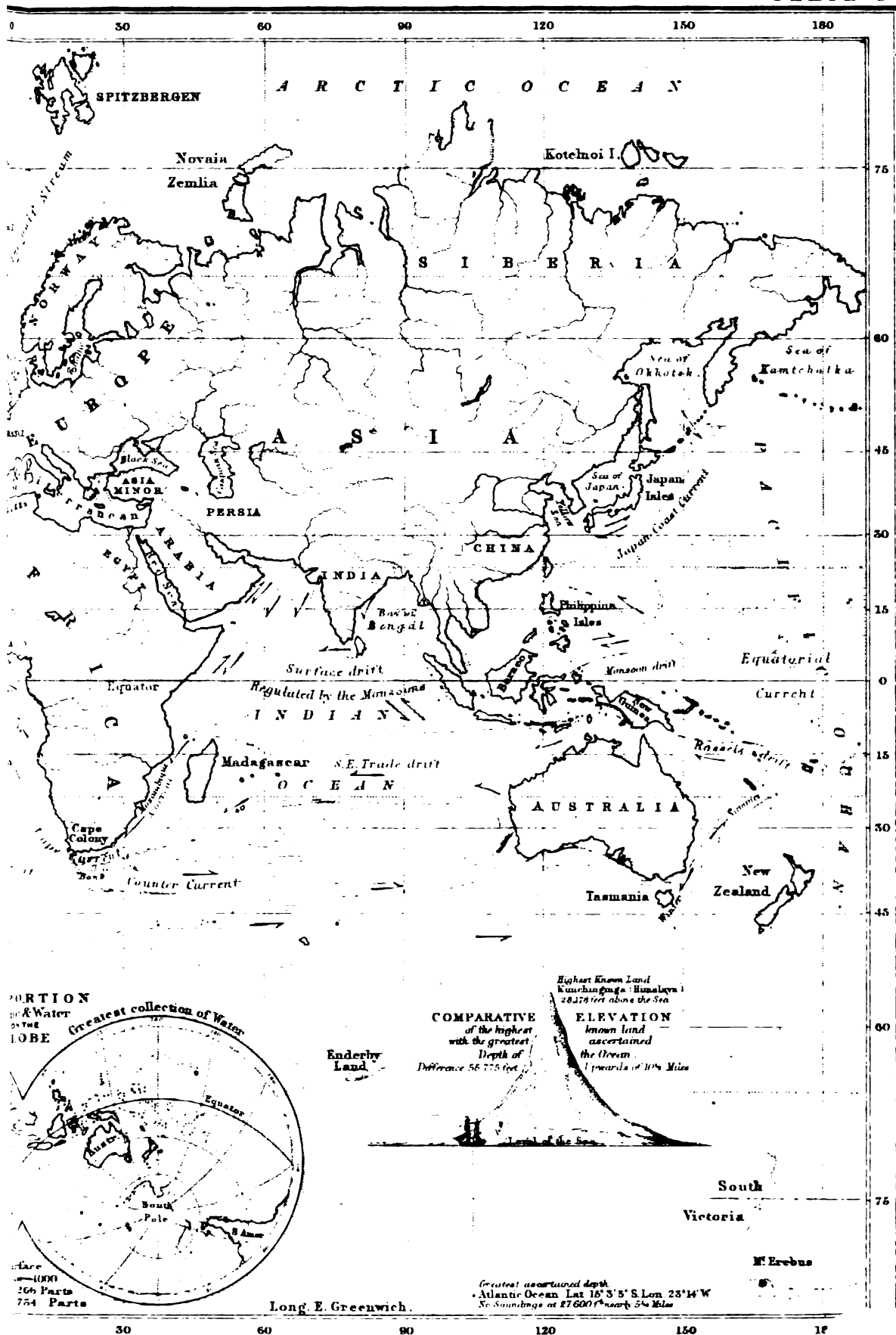
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Arctic Ocean. ☐

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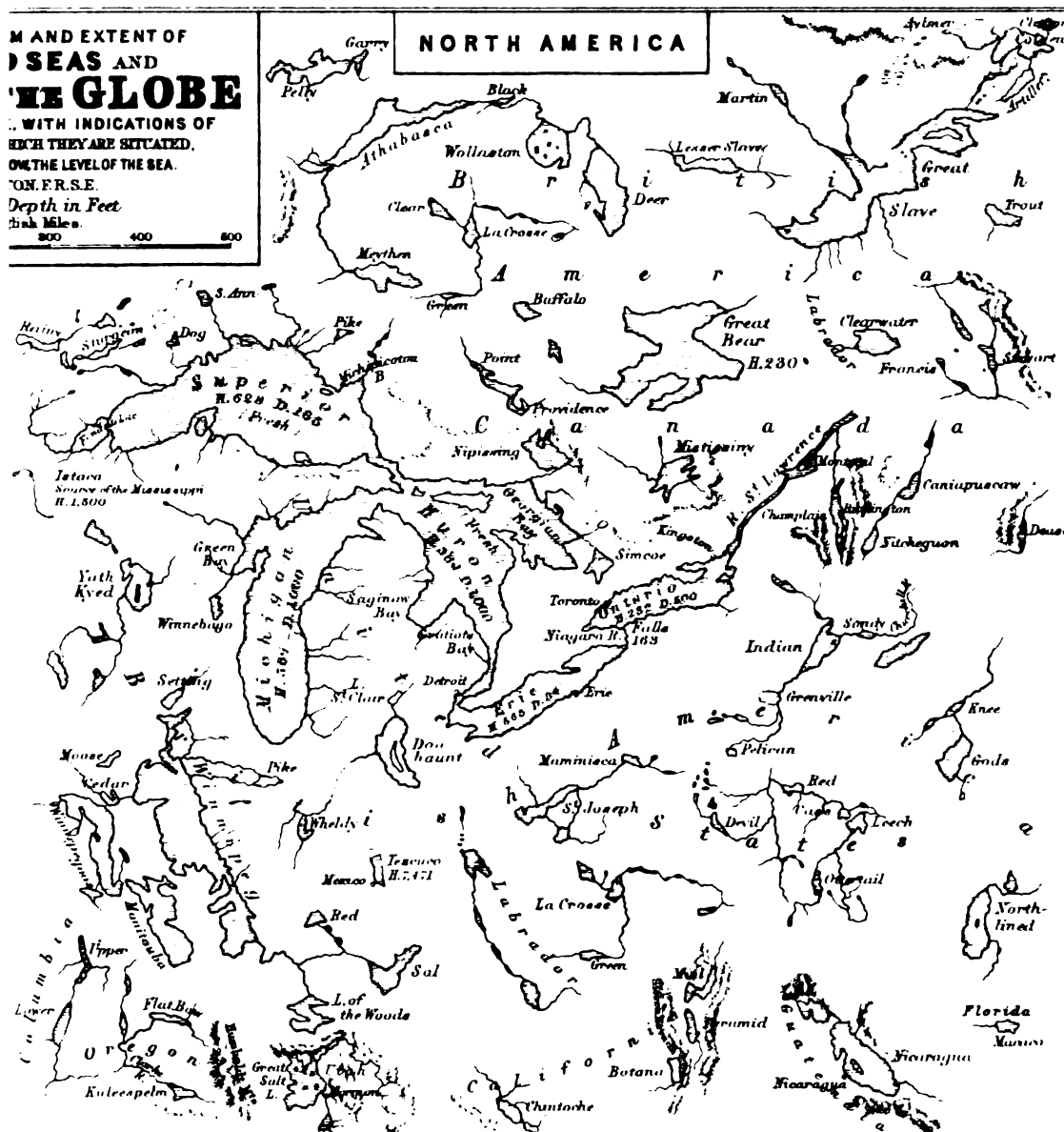
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MAN AND EXTENT OF DISEASES AND THE GLOBE

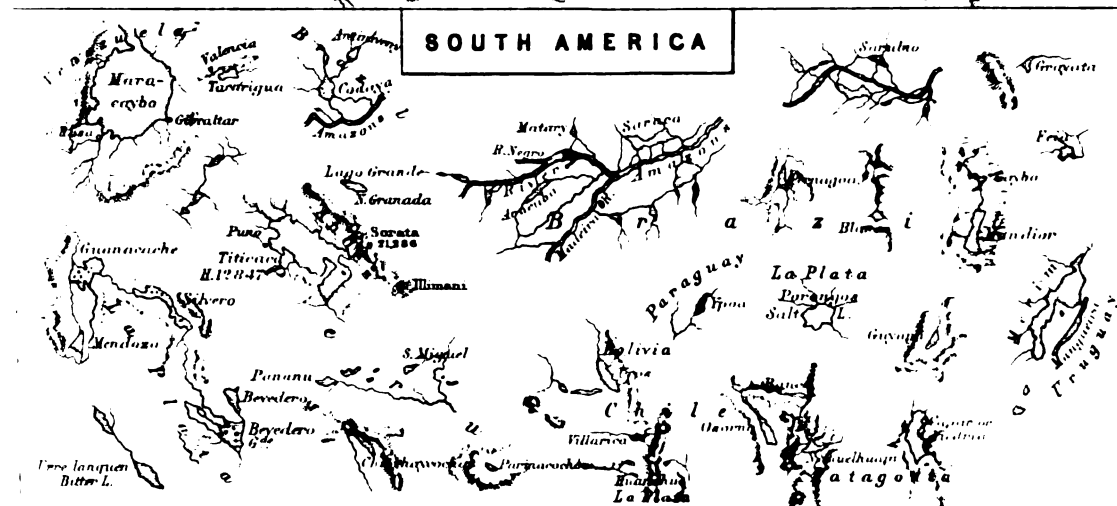
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NORTH AMERICA



SOUTH AMERICA





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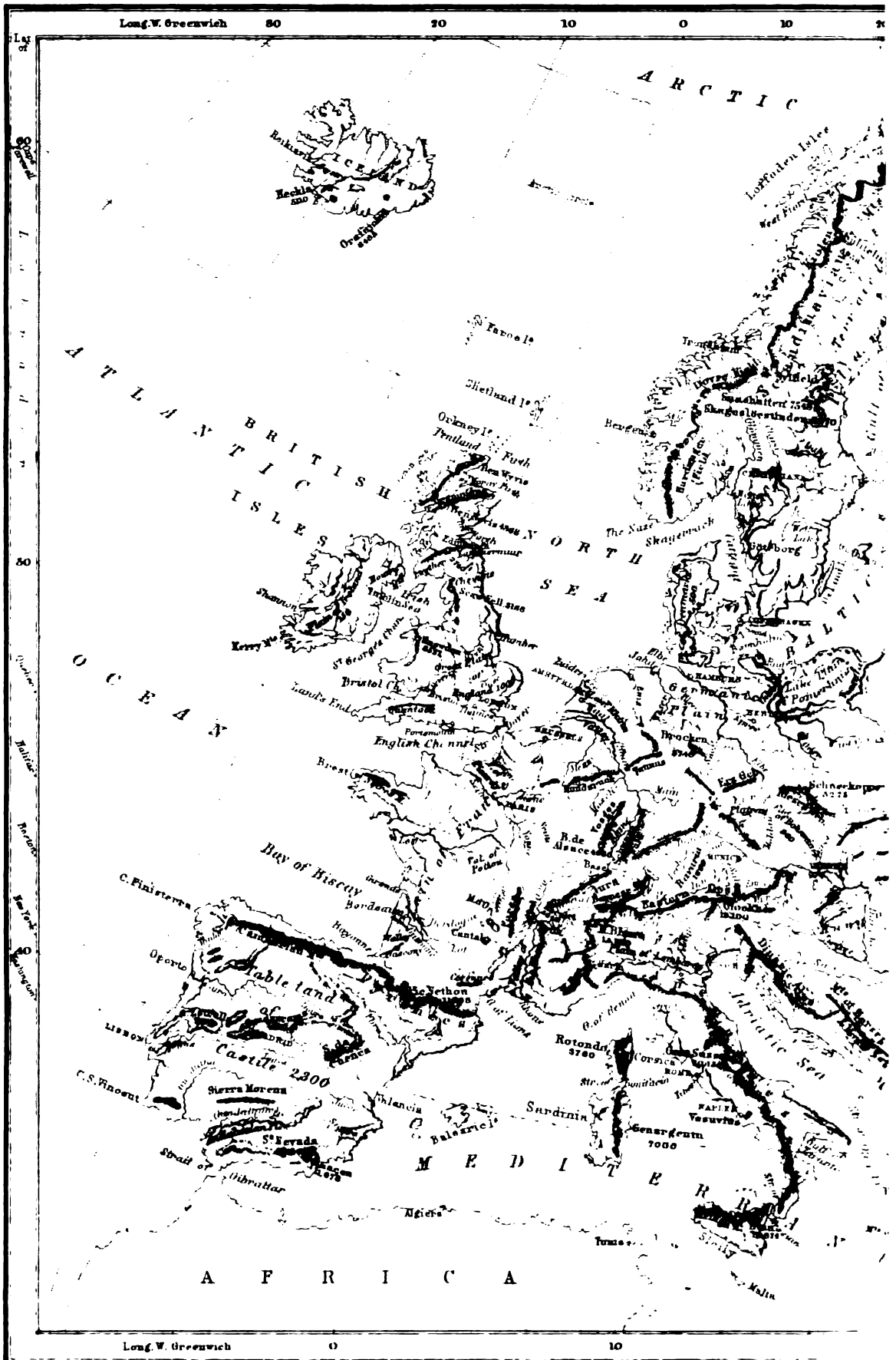
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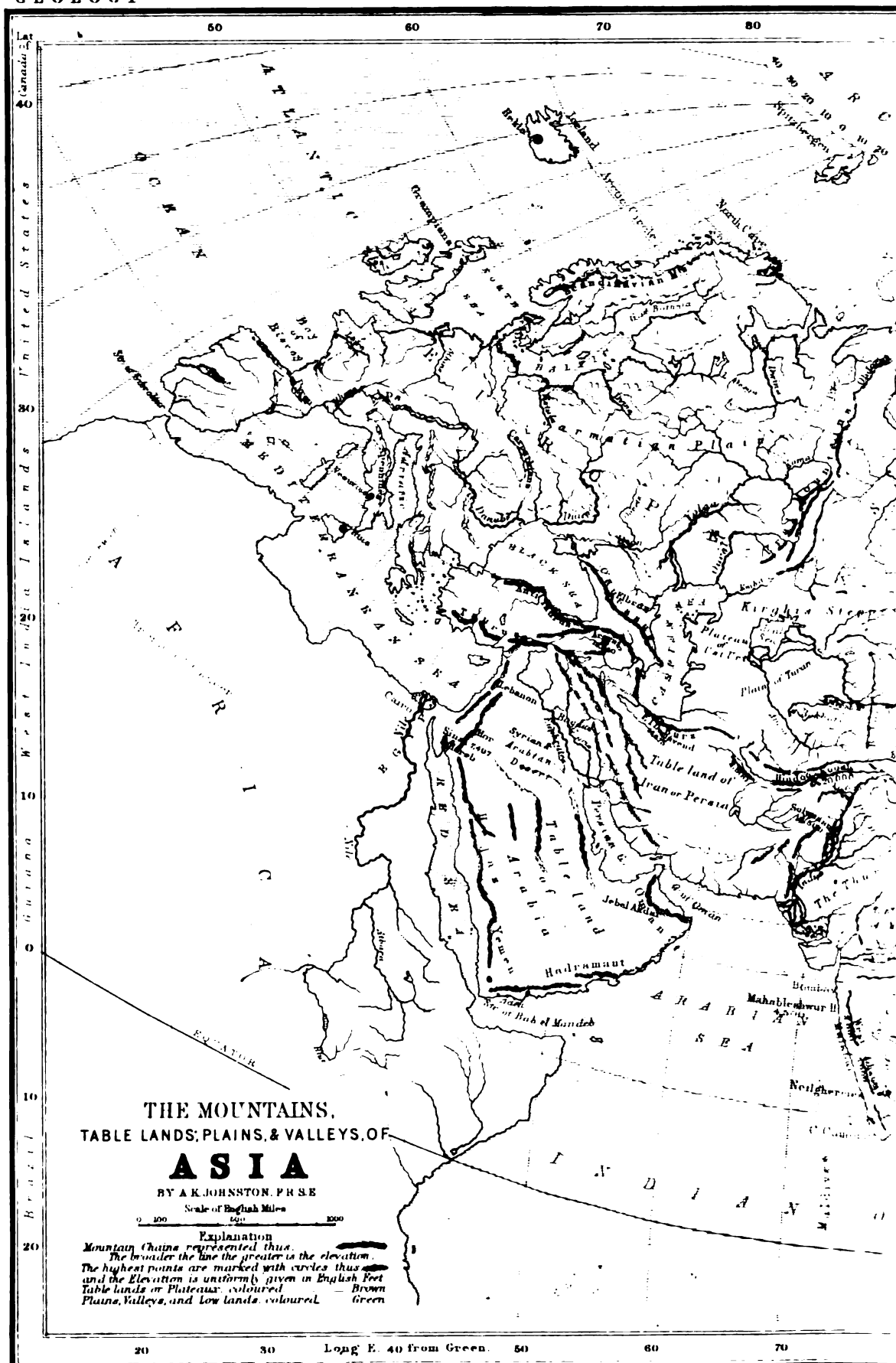
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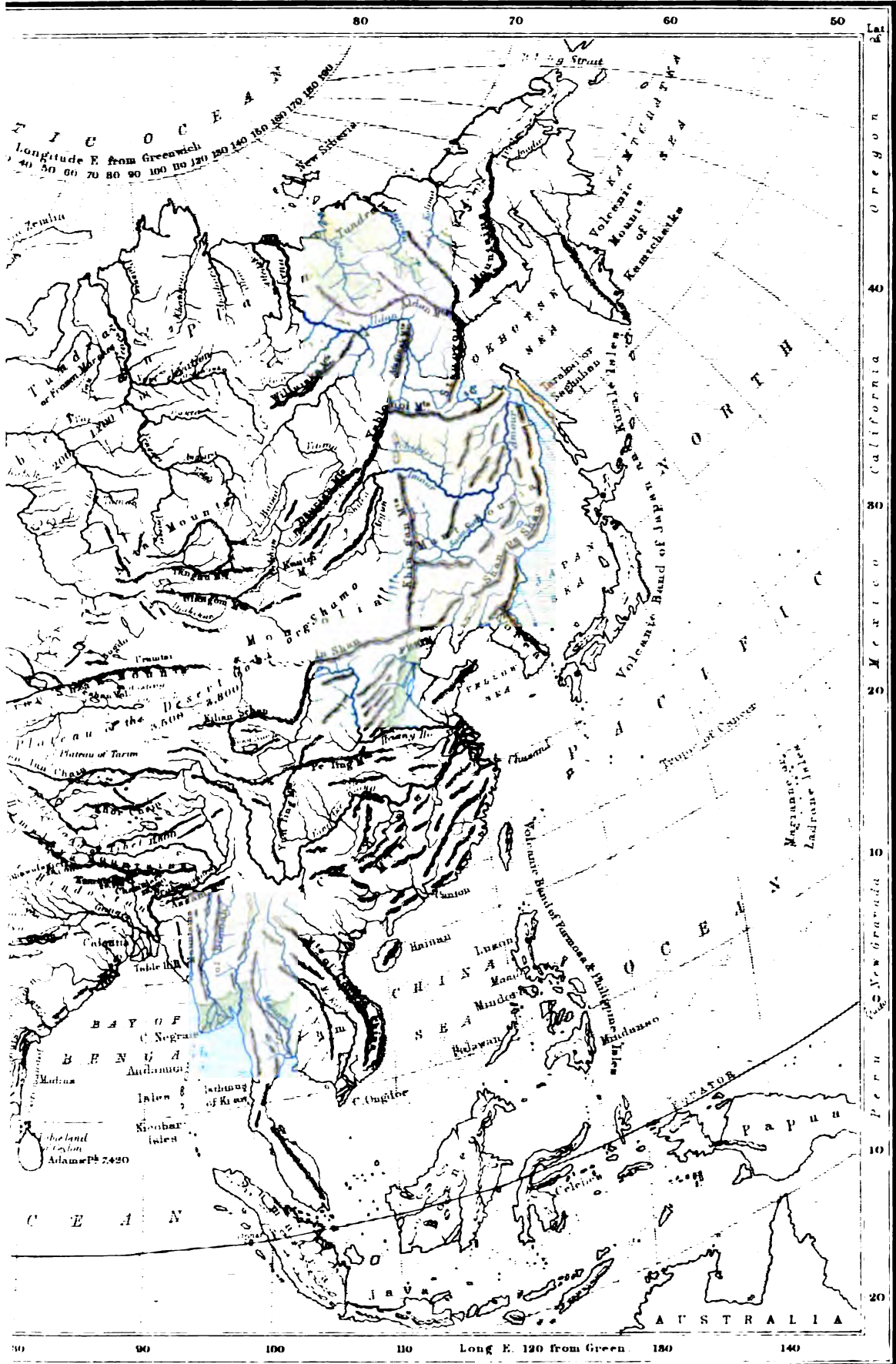


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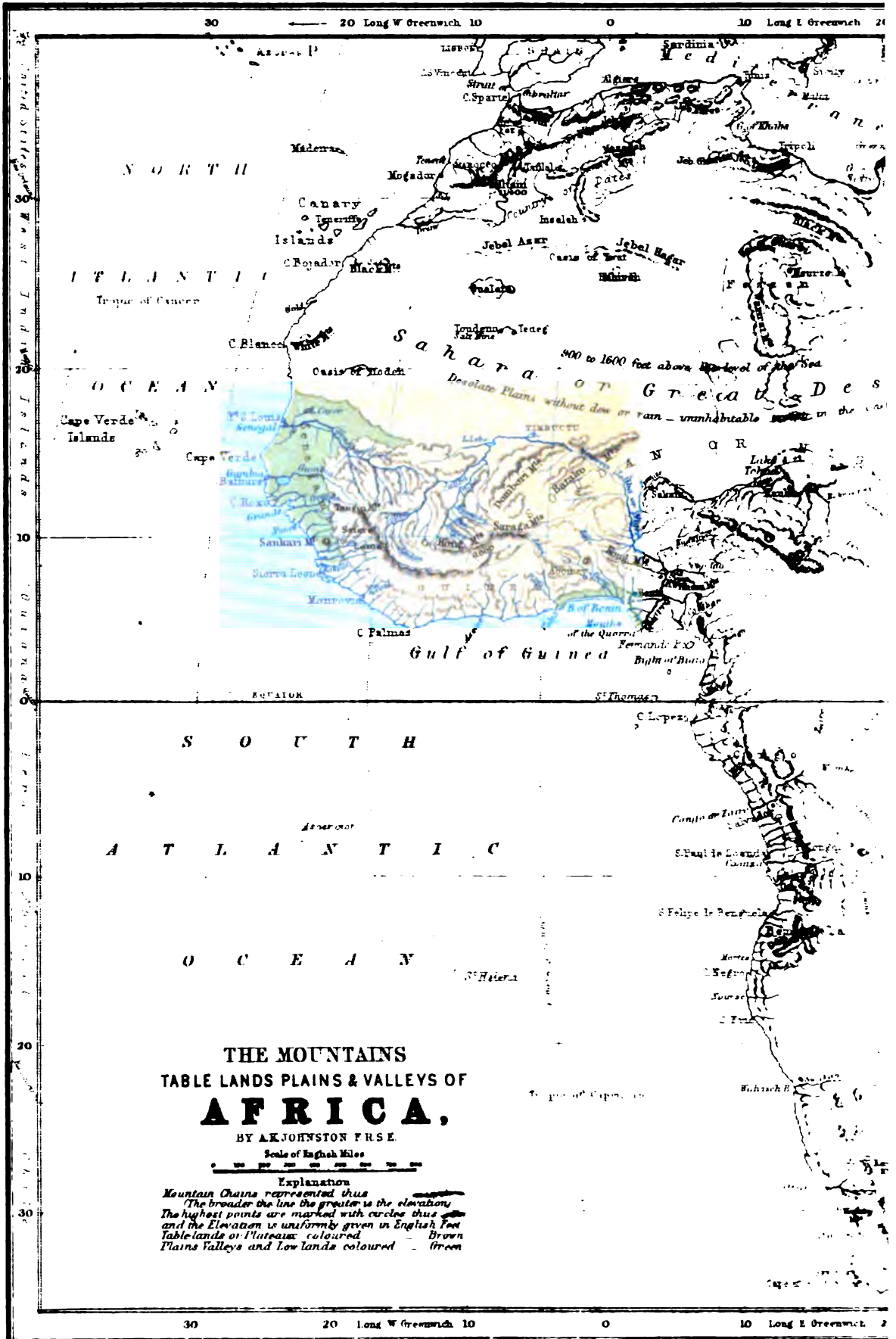
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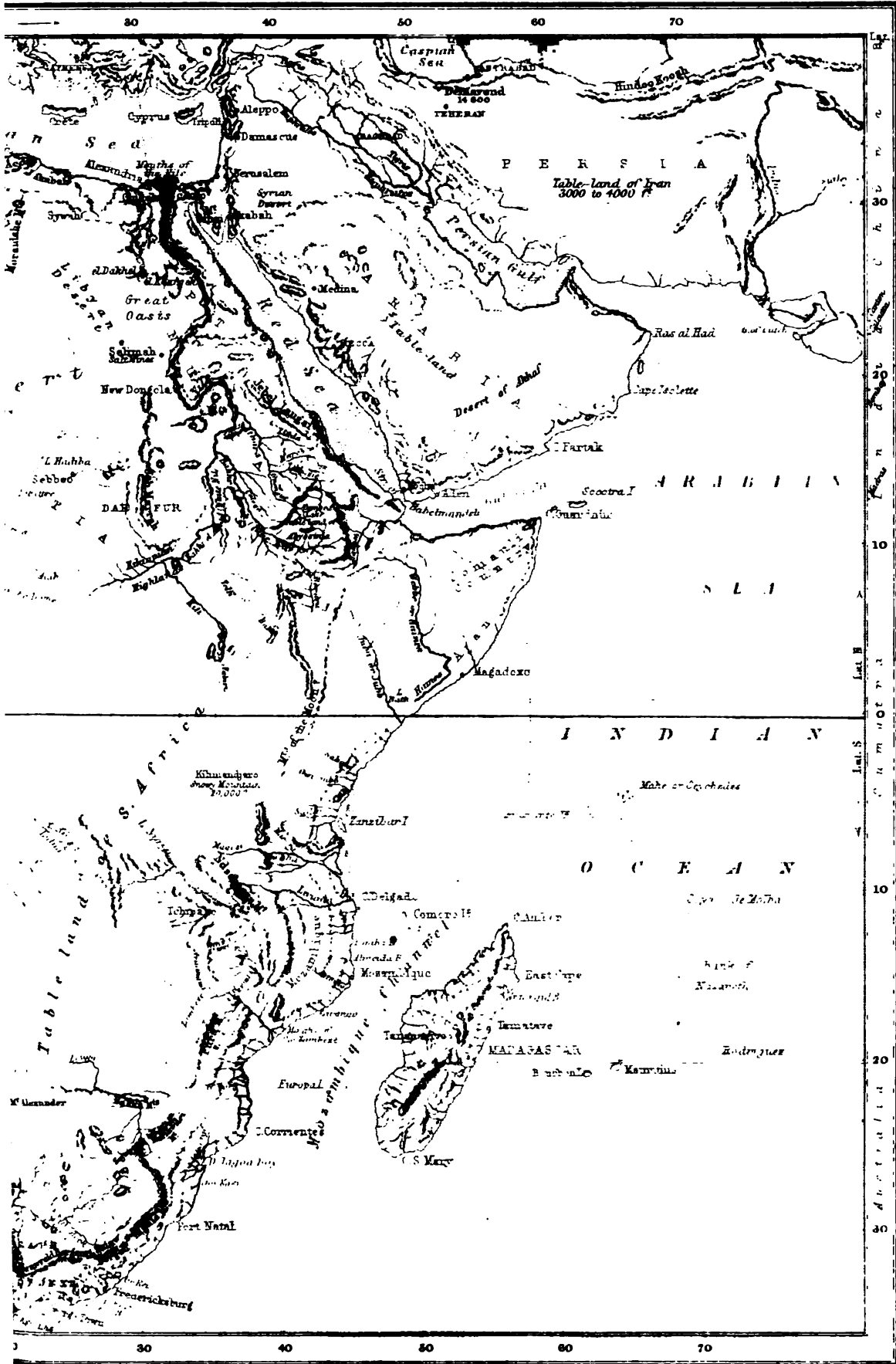
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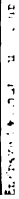




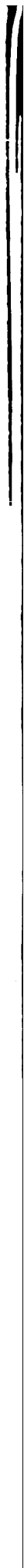
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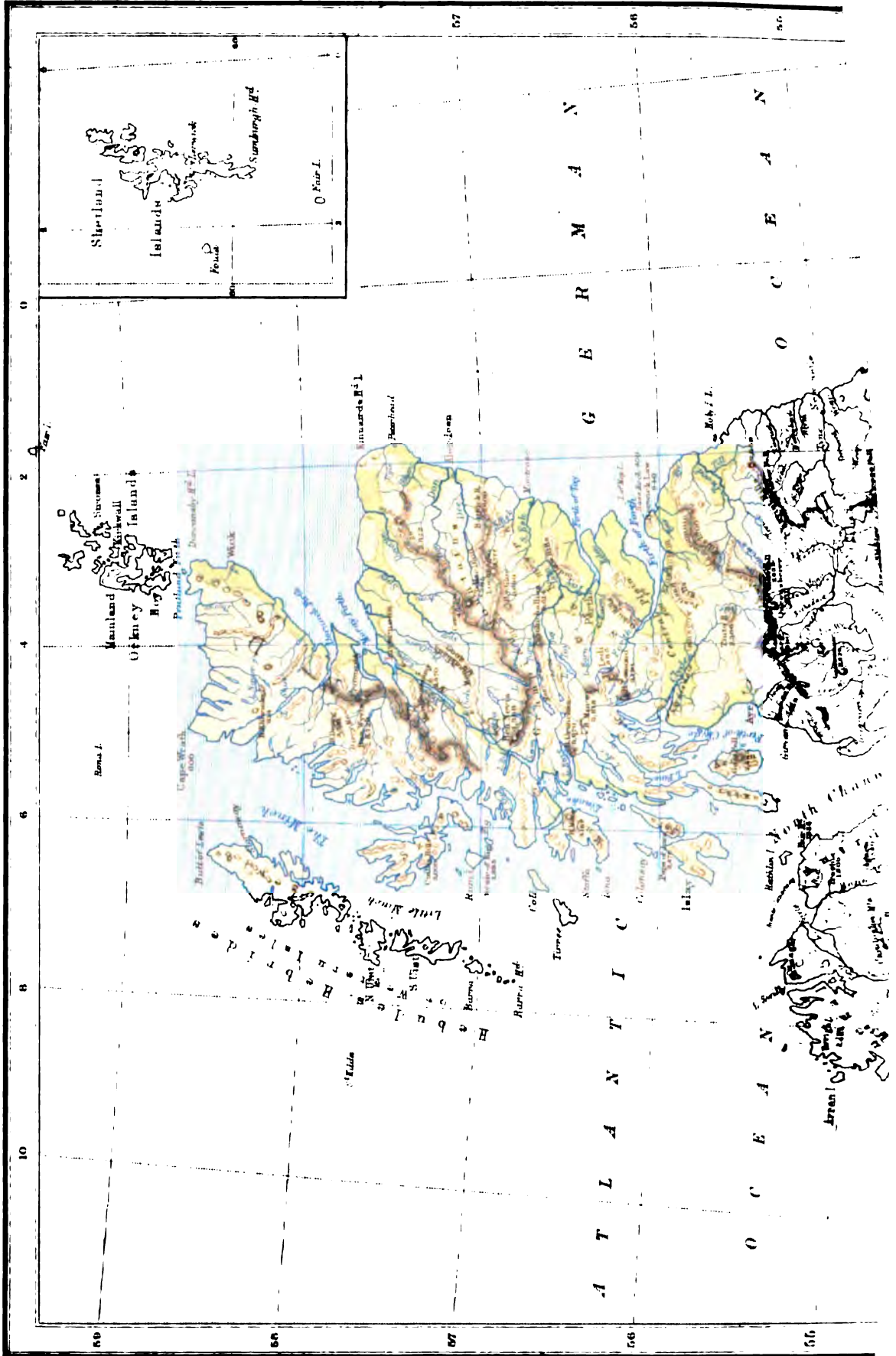
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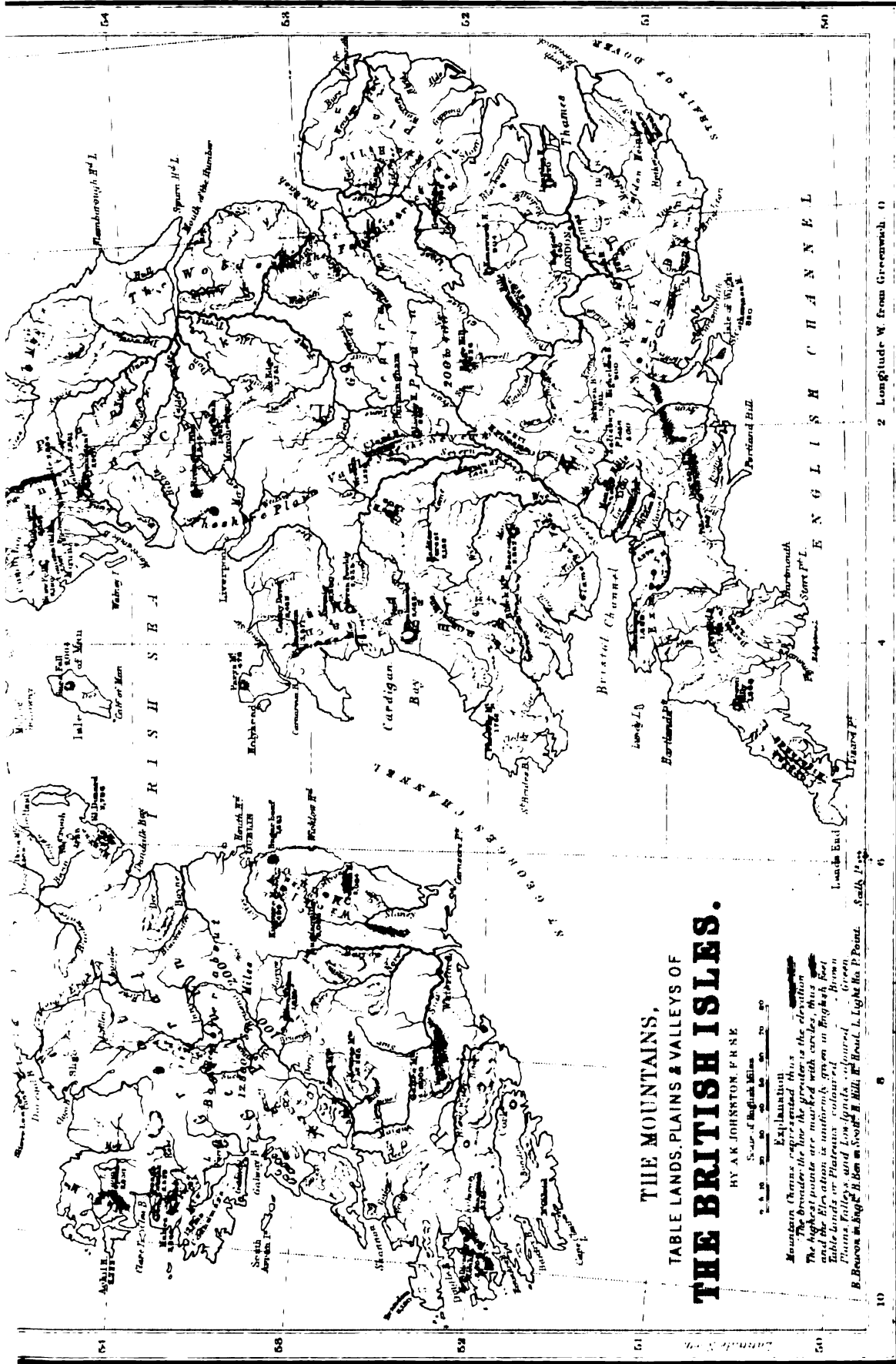


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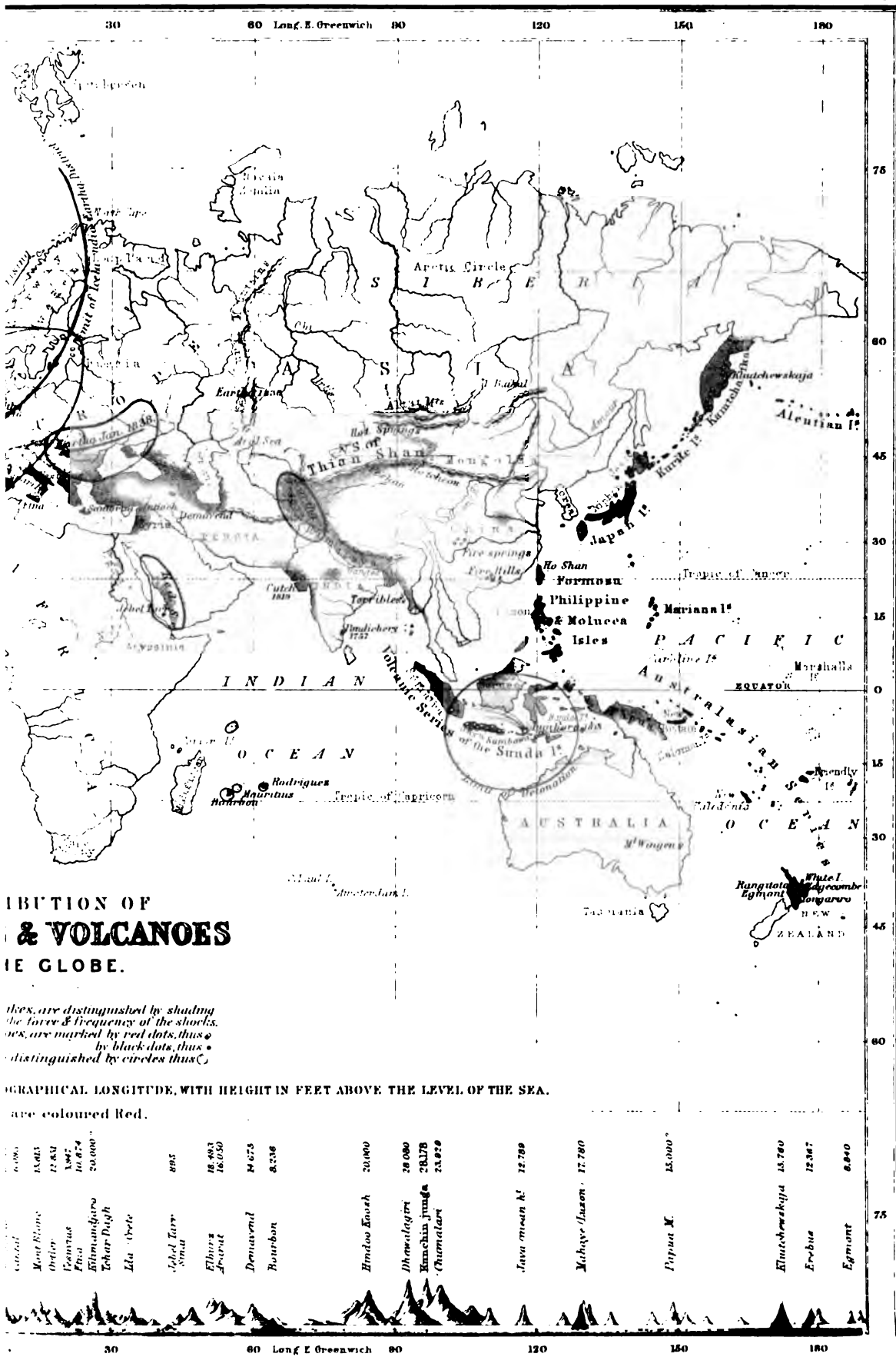
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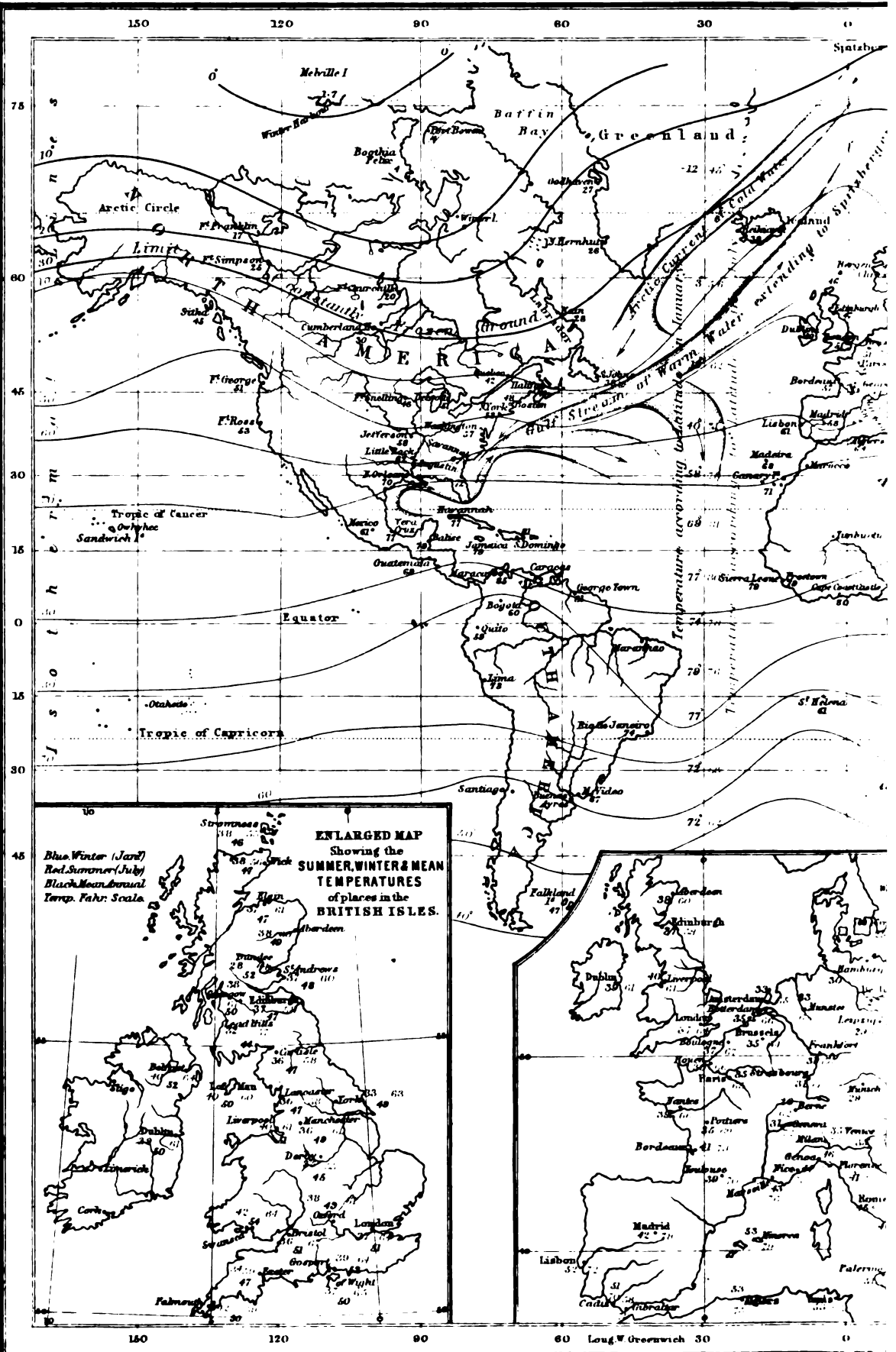


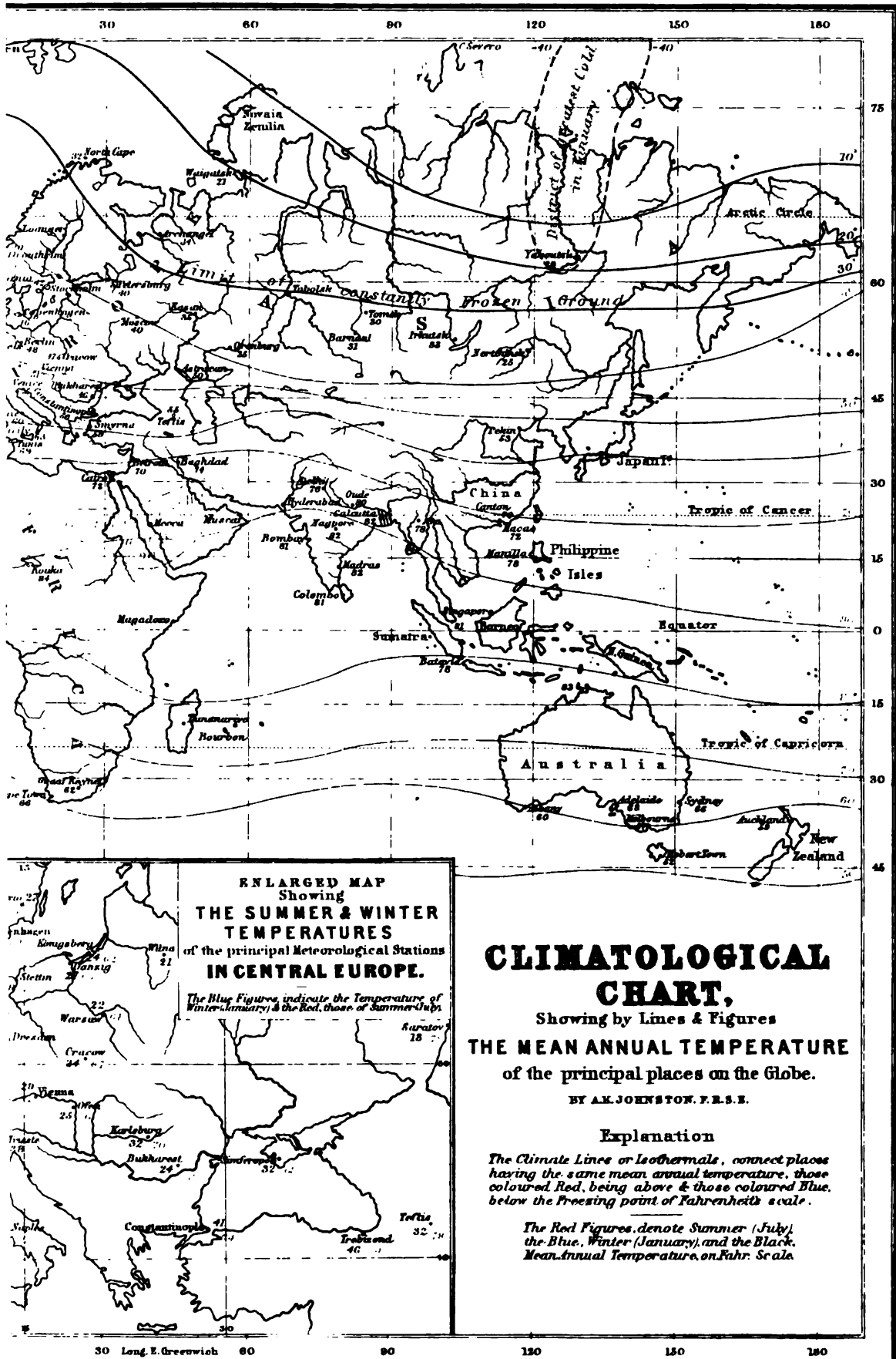
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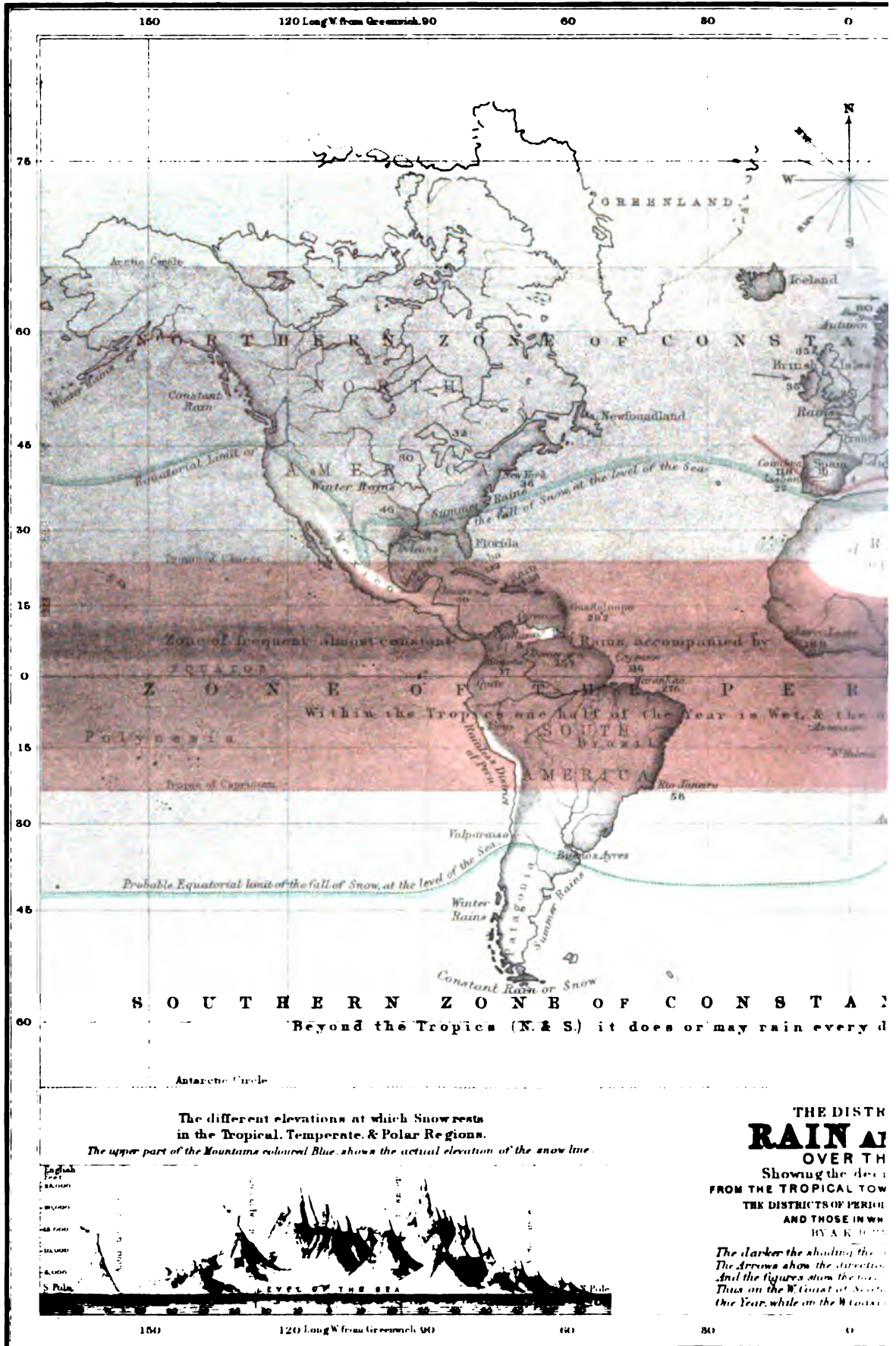


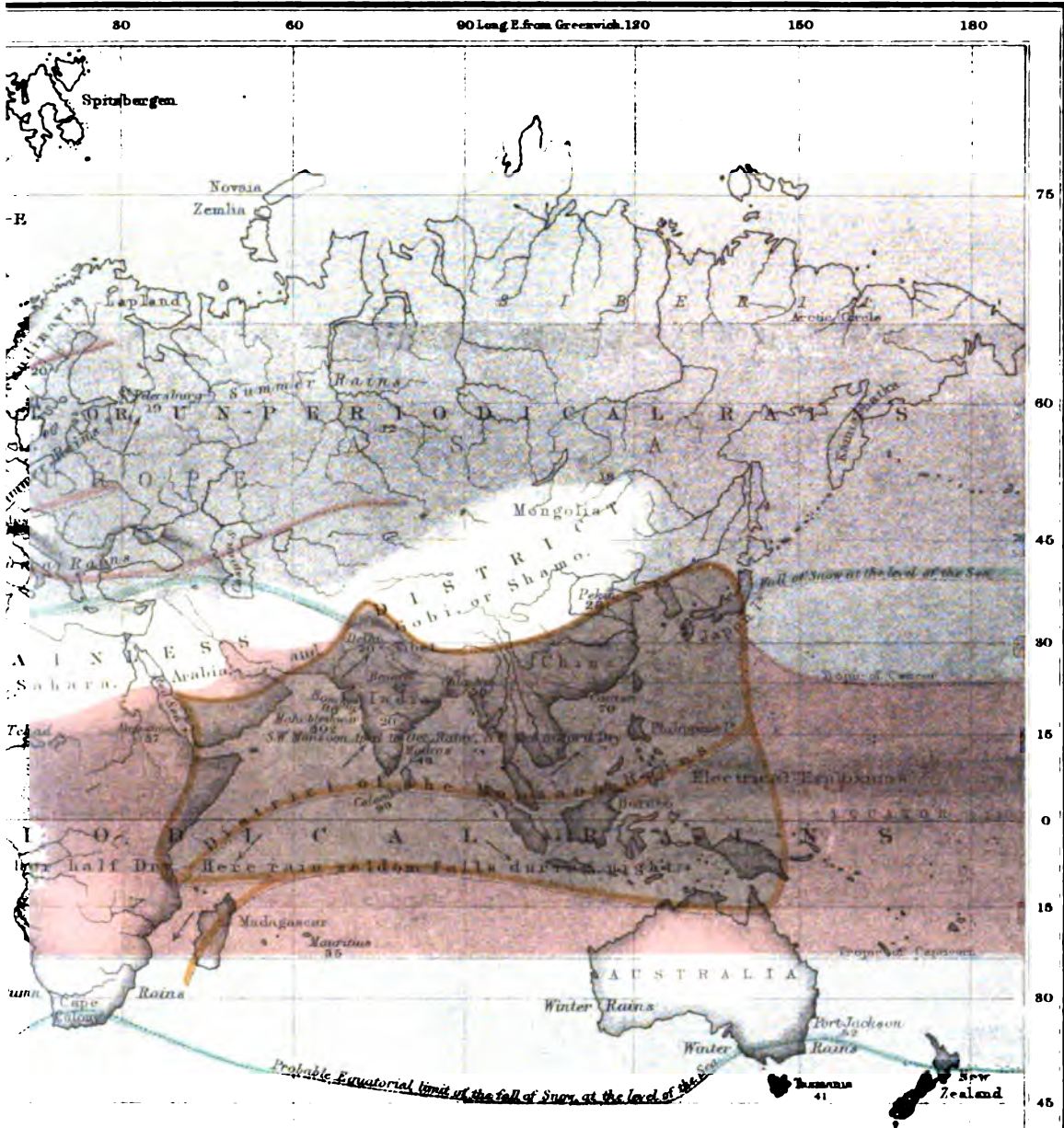
METEOROLOGY







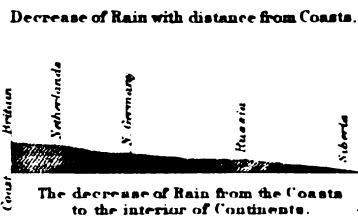
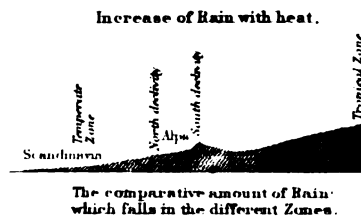




T O R U N - P E R I O D I C A L R A I N S

**DISTRIBUTION OF
FALL OF SNOW
ON THE GLOBE**
Cause of Moisture
RDS THE POLAR REGIONS
TROPICAL AND SEASONAL RAINS
WINTER RAINS
SUMMER RAINS
POLAR RAINS

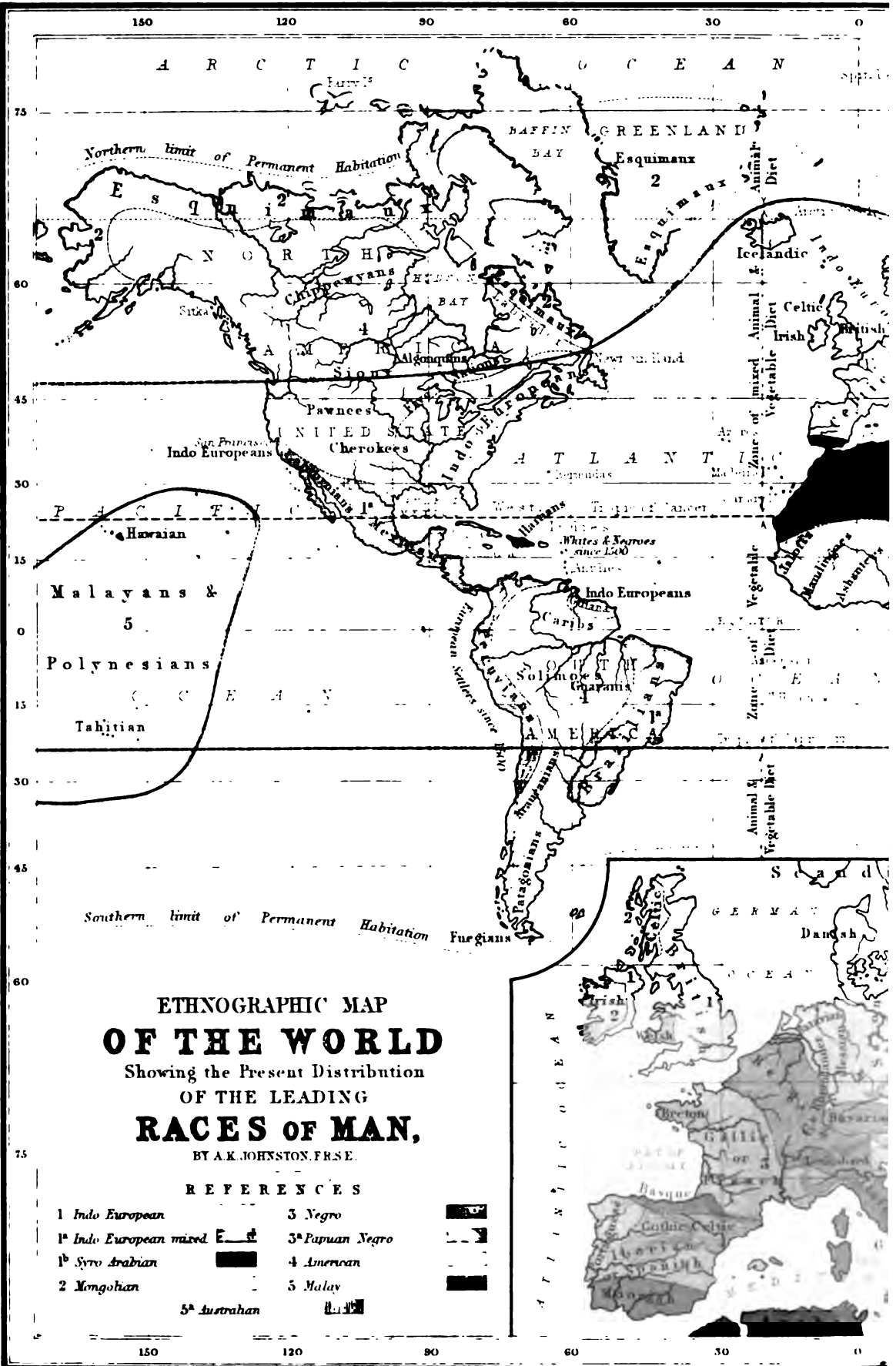
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of the winds which bring Rain,
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not 35 inches of rain falls in
Africa the amount is 189 in.



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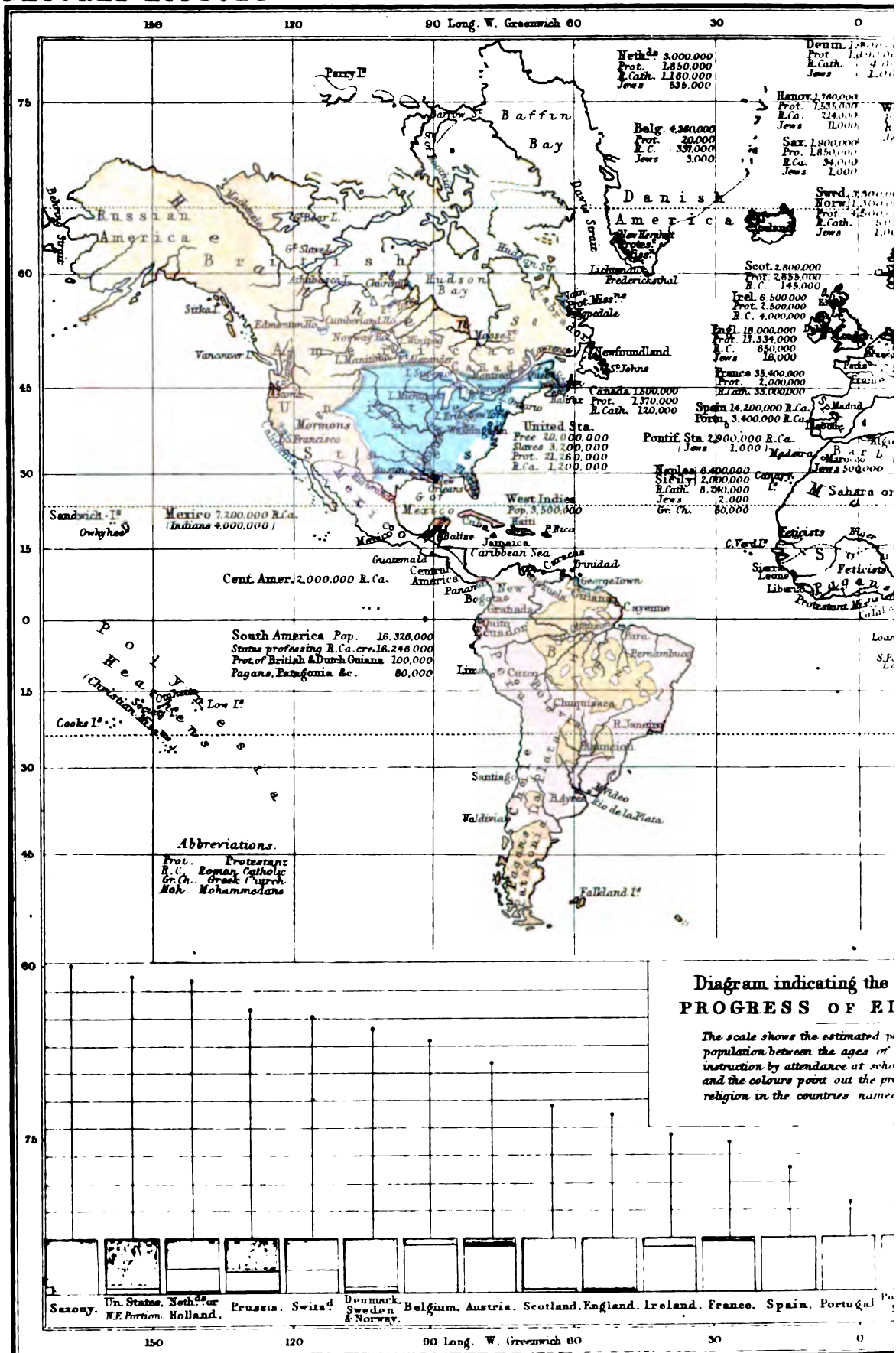
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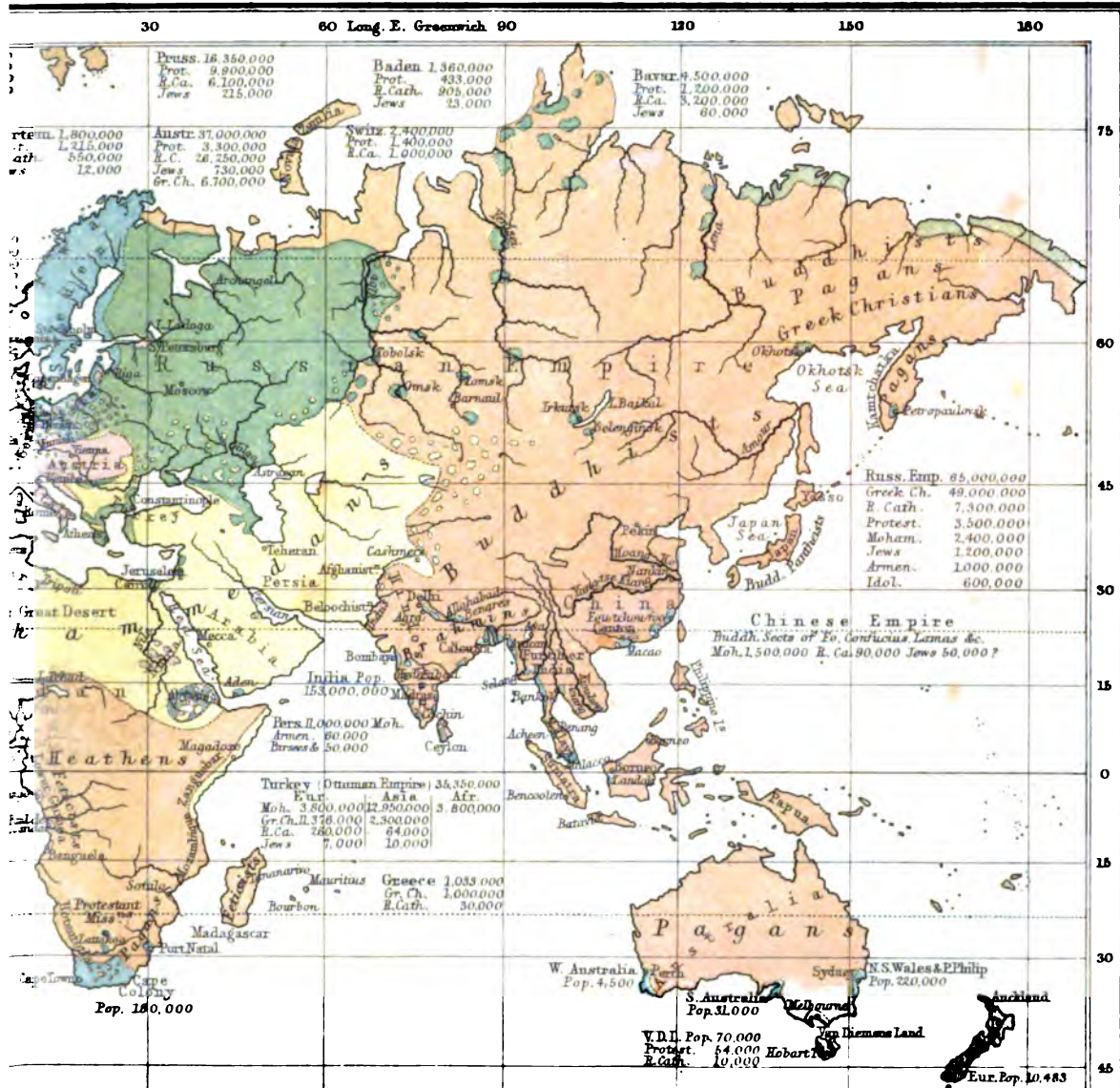
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NATURAL HISTORY

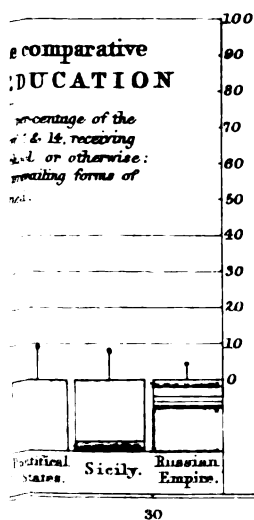




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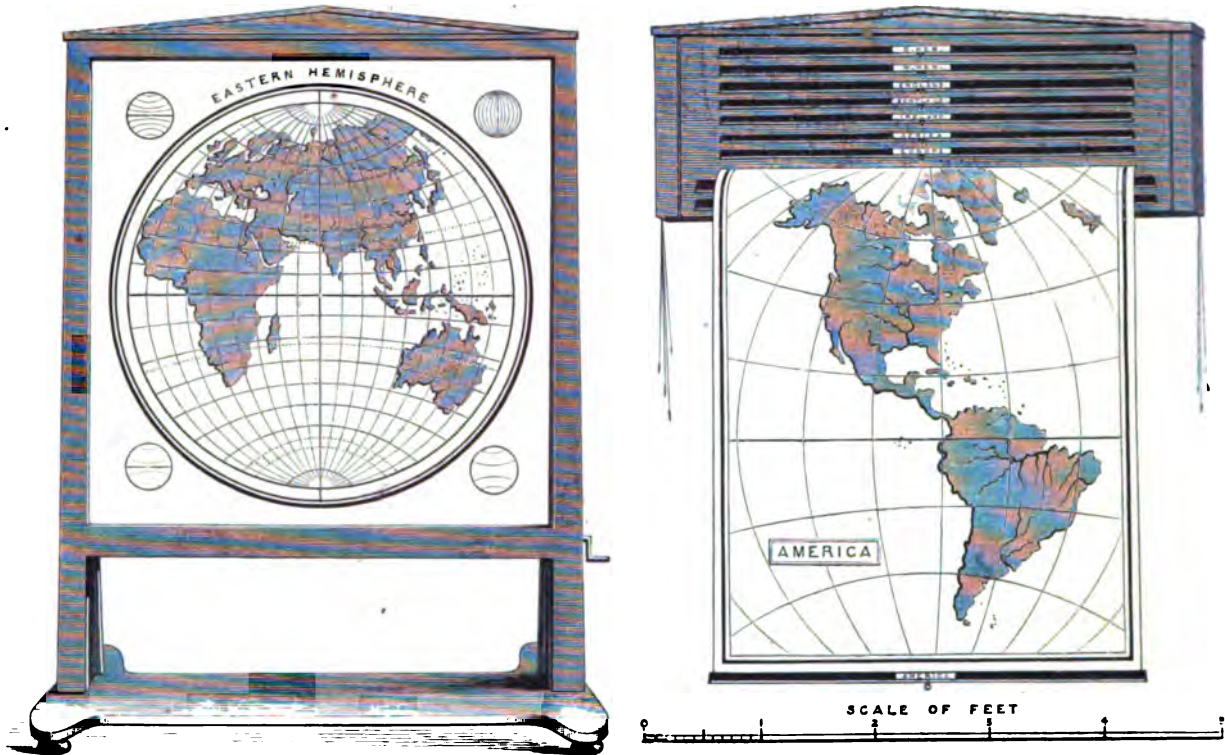
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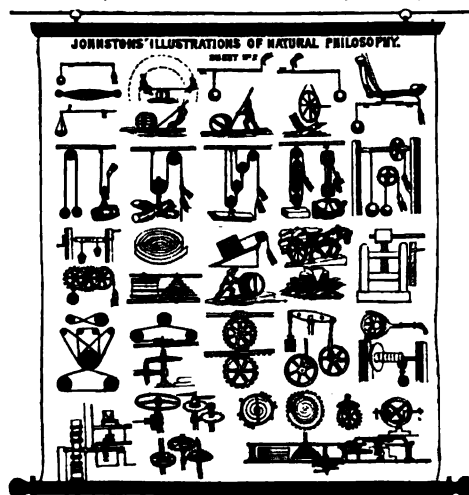
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